Sustainable Holistic Agricultural Development through Jain Irrigation Systems

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Preface

Jain Irrigation Systems Limited, Jalgaon is said to be one of the leading manufacturers and suppliers of micro irrigation equipments in India and it is the most popular company in Maharashtra. Unlike manufacturers of general equipments of common use, manufacturing and supplying of micro irrigation equipments are not only a business activity but also a service to the society and to the nation in terms of conservation of precious water, energy and environment, let alone leave its contribution to the food security of the nation.

In order to understand the contribution of micro irrigation systems to the social and economic life of the people particularly the farmers and also the contribution of Jain Irrigation Systems in this endower, the Jain Irrigation Systems Limited approached Tata Institute of Social Sciences, Mumbai, to undertake a study to assess the nature, extent and process of social and economic transformation in the life situation of farmers who have been part of the micro irrigation system, with particular reference to Jain irrigation systems.

The study involved a sample household survey of farmers and non-farmers, focus group discussions with farmers, their wives and youngsters, case studies with progressive farmers, and observation visit to a number of villages in Jalgaon district. The survey including FGDs and case studies covered various aspects of household such as landholding, drip/sprinkler installations, crop cultivation, experiences with drip/sprinkler, socioeconomic condition of households, schooling of children, fertility, morbidity and nutrition. The present report is the outcome of the survey undertaken in rural Maharashtra during May-July, 2011.

We take great pleasure in presenting the study findings in this report, and hope that the report will provide insights into the recent improvements in the adoption of micro irrigation systems by farmers and its contribution to their prosperity. We hope that the report will provide a rich amount of information not only to the Jain Irrigation Systems Limited but also will serve as a source material for the Government, policy makers, NGOs, social workers and the research community in general.

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We are specifically thankful to Mr. Ajit Jain and Mr. Atul Jain with whom the study team had extensive discussions on the various activities of the Jain Irrigation Systems Limited and also on the modalities of the study. The study team had interaction with almost all departments of the Jain Irrigation Systems Limited about their activities and are many to name them individually. We thank them all for their cooperation and assistance. We would like to place on record the services of Mr. V.B. Patil and Mr. Chintamani Nandedkar of Jain Irrigation Systems Limited from the initial stages until conclusion of the field work.

Last but not the least the research team is grateful to the respondents to our questionnaire, FGD participants and case study respondents who have patiently spent more than one hour of their time with our investigators and responded to the questions on various aspects of the study with all sincerity.

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Contents

List of Tables

Executive summary

Introduction

Agriculture is the backbone of the Indian Economy. Day by day the Indian population is increasing and therefore the food requirements are also increasing. But at the same time the arable land area is decreasing because of increasing demand for housing and industrial requirements and decreasing water availability for agricultural use. Hence, there is a need to increase the agricultural productivity of different crops for the food security of the nation within the available arable land by conserving water and adopting modern agricultural practices. The problems can be tackled by judicious use of the available water and by adopting innovative irrigation systems such as drip and sprinkler irrigation.

Jain Irrigation Systems Limited

Jain Irrigation Systems Limited (JISL) introduced drip and sprinklers that are suitable to Indian agriculture through their integrated system approach which includes indigenization of drip and sprinklers to suit India's small farmers and varied climatic conditions, together with, service support for products, strong agronomic product to farmers and system demonstration through field research and development. This technology has changed the lives of not only large farmers but also many small and marginal farmers in rural India and it has demonstrated the potential to transform the whole of rural India. In the state of Maharashtra alone, the company covered a total of 180 thousand hectares of land under drip irrigation in 2010-11. Under sprinkler irrigation also, in Maharashtra, the company covered a total of 91.5 thousand hectares in 2010-11. A similar progress was made in the other states of India as well but the highest contribution was in Maharashtra state.

JISL Products

PVC pipes: In the 1980's JISL ventured into manufacturing of PVC pipes under the brand name *JAINPIPE* and started supplying the product to farmers in Maharashtra, Madhya Pradesh, Gujarat and Karnataka. Soon, due to good quality, the brand was established as a reliable one with premium valuations. It was only with the advent of PVC pipes, together with its cost reduced to a third of the cost of CI and DI pipes, that everyone from large to small and marginal farmers stopped the practice of furrow irrigation and shifted to PVC pipes. With PVC pipes installed, the water being wasted was reduced by 50 percent.

Tissue Culture: In the early 1990's JISL conducted an extensive survey to select a crop beneficial to propagate through tissue culture before entering into this business. The company has select-

ed banana as a crop from horticulture group for propagation through tissue culture. The tissue culture laboratory of JISL is the biggest for banana in the world and currently JISL is the only innovative enterprise in India producing over 30 million plants of Grand Nain variety of banana per annum. In other crops, it propagates sugarcane, potato, onion, pomegranate, ginger and turmeric. While onion and pomegranate are propagated on commercial scale, sweet orange, guava are under research.

Food Processing: JISL manufactures dehydrated onion, vegetable products and ascetic fruit purees, concentrates, clarified juices, and frozen products of finest quality, and market them internationally under their brand name FarmFresh. It has the most controlled modern, world class fruit processing facility at Jalgaon in Maharashtra, Baroda in Gujarat and Chitoor in Andhra Pradesh. It process selected varieties of banana, guava, mango, pomegranate, amla and tomato that are brought either through the contract farming system of the company or directly from open markets.

Contract Farming: The Jain Irrigation Systems Limited has forged mutually rewarding relationships with farmers to feed the food processing factory through a unique and rewarding contract farming arrangement with more than 3000 farmers, especially with small and marginal framers for growing and supplying white onion. In the arrangement, the company provided high yielding onion seeds, MIS equipments, agronomy advice and buyback arrangement with minimum support price or market price whichever is higher. The company purchased about 85 thousand tons of white onion in 2010-11 from its contract farmers in order to process it into dehydrated powder.

Renewable Energy: JISL has shown two ways to explore the abundantly available renewable energy and to overcome the scarcity of electricity in remote areas. The JISL has pioneered in developing solar water pumping system which contributes not only agricultural growth but also conserves grid energy that will have a huge impact on the overall power scenario in India. However as of now the sale of solar pump sets is not substantial to report statistically but it is hoped that it will pick up in the coming years. Apart from the solar pumps, JISL also manufactures solar lanterns, solar power systems and solar street lights which of course help in remote areas to overcome the darkness. They also manufacture solar water heating system which can also be used in case of hard water. As a result of the food processing, a large quantity of organic agro waste like fruit peels, rotten fruits, discarded puff purees is generated at the Jain Food Processing facility that has led the company to set up a Bio-methanation plant. The plant is generating 1.7MW gross power.

Jain Green Houses: Jain Green Houses are built of GI structures that have a variety of applications, the majority being, off-season growing of vegetables, floriculture, planting material acclimatization, fruit crop growing for export market and plant breeding and varietals improve-

ment. Jain Green Houses are available in different sizes and constructed as per customer requirement. The sizes vary from as small as 100 Sq. M to 10,000 Sq M and even more. The degree of sophistication also varies from a simple polyhouse with polythene sheet covering to a highly sophisticated, fully automated systems with Poly carbonate sheet roofing (double walled), PAR lightings, boom irrigation, rolling benches and full scale computerized (fully automated) systems.

Village Rejuvenation Efforts: The management of JISL is committed to the betterment of the society through their Gandhi Research Foundation (GRF). The management of JISL has established some Schools and Colleges and of them a few notable institutions are: (1) Wakod, the birth village of the founder, has been the nerve centre of many charity initiatives. Of which a higher secondary school with over 1100 students is a notable example. (2) "Anubhuti" at Jain hills is a co-educational, residential, English medium school affiliated to the Council for the Indian School Certificate (CISC) and following the ICSE syllabus. (3) "Anubhuti-2" is scheduled to open in July 2011. It is reserved for children of economically backward section. (4) At Chandwad, Nasik district, Sow. Kantabai Bhavarlal Jain College of Engineering and the Hiralal Hastimal Jain Brothers Polytechnic are doing yeomen service to the region. Also it runs a few primary schools. Training programs are offered at its "Gurukul" training centre at Jalgaon to agricultural officers of State Government/Banks and farmers of other states/countries.

JISL as Multinational Company: JISL has now grown into a multi-national company with factories and/or business establishments in different states within India and in different countries like United States, United Kingdom, Switzerland, Israel and many Asian and African countries. JISL is a major agri-business player internationally and the single most player in India with "One stop shop" for various agri-products and also for exporting PVC pipes and sheets, drip irrigation sets, sprinkler, tissue culture saplings, green houses, solar products, processed foods and dehydrated vegetables. All products are having ISI and ISO standards certificate which make it easier to compete in the world market.

Study Design

The Jain irrigation system limited (JISL), Jalgaon approached the Tata Institute of Social Sciences (TISS), Mumbai to have an overall assessment of the impact of the micro-irrigation system (MIS) in general and of JISL in particular on the socioeconomic rejuvenation of the rural community, particularly the farmers. Accordingly a study was undertaken in the state of Maharashtra where the penetration of micro-irrigation system was stated to be one of the highest in India. The study relied primarily on the perception and experiences of a cross-section of the rural community (farmers and agricultural labourers, or landholding and landless households) distributed across the state of Maharashtra.

The sample household survey covered a sample of drip irrigated farmers (households), flood irrigated farmers (with no land drip irrigated), rain-fed cultivated farmers (with no land irrigated) and landless (other than cultivated/irrigated) households on various aspects of their socio-economic condition, landholding and drip/sprinkler installation, crop cultivation and experiences with drip/sprinkler. Anthropometric measurements of children below 5 years, adolescent males and females (13-19 age group) and women of reproductive ages (15-44) were also made to assess their nutritional status. Altogether 4175 households were covered in this survey, selected from 9 districts, with varying drip densities, from Maharashtra state. The survey was conducted during May-July, 2011.

Focus group discussions (FGDs) with farmers in general and drip irrigated farmers in particular about various aspects of their experiences with agriculture in general and drip irrigation in particular, were conducted. The FGD groups included drip farmers, wives of drip farmer and young men aged 19-35 years.

Household Characteristics

The study population was predominantly Hindus constituting 90 percent of all households, 13 percent were scheduled castes (SCs), nearly 7 percent were scheduled tribes (STs) and 10 percent Nomadic tribes (NTs) and denotified tribes (DTs). Among the households, 25 percent were in RCC/pucca houses and a large proportion of 45 percent of the households were living in semi-pucca houses. About 90 percent of the houses were electrified. More than a half (of the households did not have toilet facility and it was high (62 percent) among scheduled castes and scheduled tribes.

With respect to source of water point, tap was one of the sources of water for as many as 92 percent of households and it was predominantly the main source of water for 80 percent of the households. More than 50 percent of the households had tap connection within their premises (own/shared). Bore well was used by 30 percent of households and open well was used by 47 percent of the households. With respect to fuel, wood (including straw, grass and crop residue) was the predominant main source of fuel for as many as 76 percent of the households and one of the sources for 92 percent of the households. Further, around 32 percent of the households had LPG connection, 48 percent of the households used kerosene and 26 percent used cow dung as fuel in their houses.

Literacy and Educational Levels

Among the household members age 7 and above, 88 percent of males and 72 percent of females were literate. The proportion literate among both males and also females was around 95 percent in the age group 7-24. Though overall literacy is slightly less among females, it is almost universal among both males and females in the younger age groups. With respect to educa-

tional level, about 40 percent of the males and 24 percent of the females aged 7 and above had completed high school education but in the age group 15-59 it was 53 percent and 16 percent respectively. In the age group 3-24, around 65 percent of males and females were studying and the proportion studying increased to 86 percent if only the age group 6-19 was considered. The proportion of children 3-5 years attending pre-school (Anganwadi, LKG, UKG and the like) was 47 percent among males and 43 percent among females.

Economic Activities

Overall 54 percent of the population in the age group 6 and above was engaged in some kind of economic activity during the past one year before the survey and the proportion was higher (64 percent) among males and lower (44 percent) among females. Economic activity among persons age below 15 was negligible indicating the absence of child labour but most males and majority of females worked from age 20 to 70 for their livelihood.

Nearly a half of the male and female workers were engaged in own farming activity and another one-fourth of the male workers and more than one-third of the female workers were engaged in labour work, mainly in agriculture sector. A small proportion of the workers were also engaged in other occupations such as self employment, business/services and salaried employment. The proportion of males and females engaged in own farm activity (as cultivator) was relatively less and proportion engaged as labourer was relatively higher among SC/STs, coupleless families and landless families as compared to their counterparts. It appears that agricultural works, both own farming and labourer work, are much volatile as compared to work in other sectors.

Cultivated holding of Households

In the study population 55 percent of the households were farmer households. Non-formers were as high as 61 percent among SC/STs but only 43 percent among OBC/SBC and just 30 percent among the general caste category. Among the farmers, 42 percent were marginal farmers, 35 percent were small farmers, 16 percent were semi-medium farmers and only 7 percent were medium/large farmers.

The average cultivated holding was 4.4 acres per cultivated holding household (farmer) and it was 3.0 acres for rain-fed cultivated farmer, 4.6 acres per flood irrigated farmer and 7.1 acres per drip/sprinkler irrigated farmer. The proportion of cultivated land that was irrigated was 53 percent and that was drip/sprinkler irrigated was just 14 percent. Among the currently irrigated plots, about two-thirds were under irrigation for more than 20 years and 28 percent of the plots were brought under irrigation within the past 10 years. Regarding source of water for the plots, it was predominantly open well (80 percent) and in another 13 percent of the plots, bore well was used.

Drip and Sprinkler Installations

Across all the nine study districts it was found that drip sets supplied by JAIN were the predominant micro irrigation system adopted by the farmers (61 percent of the installations and 63 percent of the drip/sprinkler installed area), followed by Netafim, EPC, Kothari, Finolex and Tulsi (each just 2 to 4 percent of installations and also of land area). The factors guiding the choice of drip/sprinkler brand were availability, quality, affordability and popularity. More than 50 percent of the currently active drip/sprinkler sets were installed during the past 2 years that is since 2009. For the drip sets installed since January 2009, the cost of drip reported by the farmers worked out to Rs. 22,200 per acre (both Jain and other drips). With respect to subsidy, only 66 percent of the Jain drip customers and 59 percent of the other drip customers reportedly received subsidy and the subsidy amount worked out to Rs. 10,400 per acre.

Cultivation

Crops and area cultivated

In the study area cotton was the predominant crop cultivated in as much as 23 percent of the total cropped area. The next predominant crops were sugarcane, sorghum (jowar) and soya bean, each accounted for 11 to 13 percent of the total cropped area. Two other crops namely bajra and wheat were cultivated each in more than 8 percent of the cropped area. A number of other crops were also cultivated each in a small proportion of area. Most of these crops were raised during kharif season except for wheat and gram. However, onion, ground nut to a great extent and jowar, fodder crops, select vegetables and maize to some extent were cultivated in kharif and rabi seasons. On the other hand summer crops were rarely raised by the farmers.

Type of Cultivation

Grapes, pomegranate and banana were predominantly cultivated under drip irrigation, while sugarcane, wheat and onion were predominantly cultivated under flood irrigation. At the same time green gram (mung), black gram (urdid), paddy, red gram (tur), sorghum (jowar), bajra and soya bean were cultivated predominantly under rain-fed cultivation. With respect to cotton, nearly 50 percent of the area was rain-fed, 34 percent of area was under flood irrigation and just 12 percent of area was under drip irrigation. As far as sugarcane is concerned, it was 88 percent of the sugarcane area was under flood irrigation and just 12 percent of the area was under drip irrigation.

Crop Yield and Expenses

The overall average yield per acre of cotton was 6.7 quintals and it was just 4.9 quintal under rain-fed cultivation, 6.9 quintals under flood irrigation and 10.7 quintals under drip irrigation. However the maximum yield reported was as high as 33.3 quintals per acre and was under drip

irrigation. Similarly for sugarcane the overall average yield per acre was 36.8 tons and it was 36.2 tons under flood irrigation and 41.0 tons under drip irrigation. At the same time the maximum yield reported was 90 tons under flood irrigation and 100 tons under drip irrigation. Similar was the case in respect of most of the other crops. The data indicate that the expected maximum yield was attained by only a few farmers but otherwise many farmers harvested much lesser than the expected yield, resulting in a relatively low overall average yield.

Expenses on raising crops and value of yield

Overall the average expense per acre was highest for drip irrigated crops and lowest for rain-fed cultivated crops. It appears that grapes and banana crops incurred the highest expenditure of about Rs. 35,000 per acre, followed by vegetables, sugarcane, tomato and pomegranate each Rs. 20,000 per acre; most of these crops were raised under drip or flood irrigation. On the other hand most of the food crops incurred lesser expenditure ranging from Rs. 3,000 to Rs. 6,000 but often these crops were raised under rain-fed cultivation. With respect to cotton the expenses were Rs. 13,400 under drip irrigation, around Rs 10,000 under sprinkler or flood irrigation and Rs. 7,600 under rain-fed cultivation.

The average value of the yield was the highest for banana amounting to more than a lakh (Rs. 1,02,300) rupees per acre. Though the expenses were the highest for banana crops, its net income (value minus expenses) was also the highest of all crops, it was Rs. 69,300. The next crop with very high net income was sugarcane (Rs. 43,800 per acre). The other crops with a net income of Rs. 10,000 to Rs. 20,000 were fruits and nuts, tomato, cotton, pomegranate, onion, grapes, vegetables/spices and groundnut (in order, high to low income). On the other hand the net income of most of the food crops was Rs. 3,000 to Rs. 5,000 per acre only.

Drip/Sprinkler Experiences

Choice of Drip Set

Generally farmers had installed drip set of only one brand. The latest installed drip set supplier was Jain in case of 61 percent of the cases and in respect of others it was a variety of companies. The number of farmers who switched company was very small. As many as 87 percent of the farmers who installed Jain drip sets reported that the quality of Jain drip set was better, as against 56 percent of farmers reported the same in respect of other drip sets. On the other hand 41 percent of 'other' drip farmers as compared to 20 percent of Jain drip farmers expressed that the drip sets were cheaper and hence they installed it. The other factors that were favourable to Jain drip sets were: recommended by other farmers, popular in the area and after sale service. According to the farmers any kind of annual maintenance contract was not in practice.

As many as 50 percent of the Jain drip set holders and 58 percent of other drip farmers were reportedly not injecting fertilizer or chemicals through drip set. However almost all drip irrigating farmers reported that their pump set was giving adequate pressure, meaning that dripping was uniform across the lines. With respect to experience of loss and/or damage of drip sets, mainly the tubes, around 30 percent of the drip irrigating farmers reported of damage due to rats and squirrels, and/or damage due to cracks, bursts. Other kinds of damages such as theft, fire, accidental damage were reported very rarely.

Perceived Reduction in Water, Power and Labour

Almost all drip farmers reported a reduction in water requirements, electricity consumption, pest and diseases and number of rounds of pest application and the quantum of reduction varied from 25 to 75 percent. However reduction in water was the most pronounced advantage of drip irrigation. With respect to labour, majority agreed reduction in labour for tilling, most admitted reduction in labour for weeding and most reported increase in labour for harvesting.

Awareness about Drip Irrigation and Perception about Youngsters

Among the non-drip farmers, more than 80 percent said that they were not aware or had no knowledge of drip irrigation and those who had knowledge perceived that drip irrigation saves water, saves electricity, gives higher yield, besides many other reasons, but only about 50 percent were aware of a dealer nearby and an equal proportion were aware of subsidy available for installing drip set.

The farmers, including majority of medium/large farmers, were not keen on their children, and, according to them, their children were also not keen on taking agriculture as their occupation mainly because agriculture income was not regular, often not viable due to high input and labour cost, and their intention to be more modern. FGDs and case studies indicated that even large farmers with drip irrigation wanted their children to have professional education that gives them a modern life with handful income.

Income and Expenditures

Annual Household Income

A maximum of 54 percent of households reported income from own agriculture and 48 percent reported income from agriculture labour work. On average in the study population only 36 percent of the total household income had come from own agriculture and 16 percent from agriculture labour work. Put together only 50 percent of the household income had come from agricultural sector occupations and the remaining 50 percent of the income had come from non-agricultural sector occupations, primarily from salaried occupations (22 percent), petty business

(11 percent) and a core of other occupations. The overall average (mean) annual household income was nearly Rs. 125,000 but the median income was Rs. 71,000 only. Among all categories of farmers, only up to 60-70 percent of annual household income was derived from agricultural sector activities and the remaining income was derived from other sources.

Household Expenditure

Among all households, only a little more than one-third of (37 percent) had used cereals/pulses from their farms but only each 10-15 percent of the households had used wheat, jowar (sorghum) and bajra and just 3 percent used rice obtained from their own farms. Similarly only one-fourth of the households consumed milk obtained from their own livestock. It appears that most of the households who produced grain, pulses or milk, consumed at least part of the produce. But unfortunately most of the households cultivated more of cash crops than of food crops with commercial motives. Also nearly 60 percent of the households reportedly received wheat and rice from the public distribution system (PDS) but only 16 percent of the households reportedly received edible oil and 24 percent received sugar from PDS. Otherwise most of the households purchased most of the food items from the open market.

Assuming that this study had captured almost all major expenses, it may be said that generally the total annual expenditure was less than the annual income of the household but the difference was marginal. Except for general caste class, medium and large landholding households, the expenditure was 70 to 80 percent of their annual income. And, in case of households with annual household income less than Rs. 1 lakh the reported expenditure exceeded the reported annual household income.

Health and nutrition

Birth and Fertility Rates

The crude birth rate (CBR) per 1000 population per year for the reference period 2006-2010 was 18 for the study population. The total fertility rate (number of life-time births per woman based on current fertility pattern) was 2, which is below the replacement level of fertility. That is, in rural Maharashtra as a whole the fertility was very low. Overall, more than 80 percent of the reference period births had occurred in health institutions such as government hospitals, private hospitals and primary health centres, and more than 95 percent of the births were registered. Further, more than 80 percent of the births were first or second order births.

Morbidity and Nutrition

In the study population 5 percent of the persons were seriously ill, chronically ill, under prolonged or lifelong medication, bed ridden, and the like (only major illnesses) during the last one

year before the survey. The incidence of illness is only slightly higher among males than among females. Overall, among children of age 2-4 (24-59 months), about 32 percent of male children and 27 percent of female children were *underweight*, 33 percent of males and 29 percent of females were *stunted* and 25 percent of males and 19 percent of females were *wasted*. Among the adolescents, 45 percent of boys and 35 percent of girls were stunted and 17 percent of boys and 9 percent of girls are severely stunted. Among the ever married women age 20-44, about 24 percent were classified as energy deficient, 3 percent were considered as severe energy deficient and 10 percent were overweight.

People's Perceptions through FGDs

Altogether 10 FGDs of drip irrigating farmers, 5 FGDs of wives of drip irrigating farmers and 3 FGDs with young men aged between 19-35 years were conducted and 10 case studies or in-depth interviews were conducted across the nine districts. Across all the nine districts it was found that drip sets supplied by JAINS were the predominant micro irrigation system adopted by the farmers. A common benefit of drip irrigation expressed by the farmers across all the districts was that despite load shedding they could irrigate their crops uniformly and almost daily. Drip irrigation also made it possible for the farmers to grow certain cash crops like strawberries in Satara, pomegranates in Solapur and grapes in Nashik, which cannot be grown without drip.

It was also reported that drip irrigation has substantially increased and sometimes even multiplied the yield of crops, especially banana and cotton in Jalgaon and grapes in Nashik. Some of the tissue culture banana farmers also said that they go for Jain tissue culture plantlets because the company itself was monitoring the growth of the crops and again their drips sets are also available and accessible within the village. In Vidarbha region which faces delayed rainfalls, wheat, cotton and soya bean are often sown in advance and sprinklers are used in the germination of the seeds during which period the requirement of water is less. And, by the time when the monsoon starts the seeds germinate into plantlets and are ready to grow with the monsoon rain. The case studies conducted in this area revealed that the farmers felt that drip irrigation had solved, at least partly their problems of labour availability, especially for large farmers, because of the fact that drip irrigation minimizes weeding, and fertigation makes it possible to apply fertilizers to the entire area of crops evenly through drip irrigation. This, together with water and electricity savings, makes drip irrigation the most effective and efficient irrigation method for many farmers.

To talk particularly of JAIN drip, it was observed that since JAIN drip sets come in a wide range of products and prices, it becomes affordable for many farmers. Hence marginal, small and large farmers adopting JAIN drip irrigation have mushroomed across rural areas. It was seen in most cases that both small and large farmers were aware of subsidies for drip and sprinkler set.

Where the dealer himself subtracted the subsidy amount from the total cost of the drip set the farmers were able to get subsidy. Otherwise, it would have been a nightmare for them if they had to claim it from the government department directly. According to a few farmers the government takes longer duration to sanction it to individual farmers and they prefer it going through the dealers as they have their links within the government and so they can get it done faster.

Despite a majority of the farmers buying their drip sets from dealers, be it JAIN or any other company, most of the farmers reported that they did not receive any formal training for installation, operation and maintenance of the drip system. It was also observed across the nine districts that small farmers preferred to install the drip sets by themselves in order to save the Rs. 500/- installation charges usually the dealers charged. The FGDs also showed that the majority of the farmers did not need any training as they were mostly well aware of the installation techniques as they have observed it in neighboring farms or they have attended some farmers meeting in their neighborhood where they were already introduced to drip installation and its maintenance techniques. Most of farmers also were technically more sound especially in Jalgaon and Nashik were drip penetration was very high and when it comes to Vidarbha region farmers were very comfortable using sprinkler method of irrigation and they installed it whenever they wanted and sometimes they even give it for other farmers on rent and help them install it in their farms especially during a delayed monsoon etc.

JAIN has a wide network of service outlets (dealers) and extension service personnel provided information, education and services for drip irrigation through campaigns, short duration orientation trainings, individual contacts, and the like. But even among JAIN customers, there were instances of farmers complaining of inadequate services may be due to the sheer volume of drip sets supplied by them.

Socioeconomic indicators of prosperity

It can be said that for an average farmer an increase in income means a better standard of living in terms of fulfilling his family's basic needs, and for some farmers it is an opportunity to invest in various kinds of movable and immovable properties, and still for some to spend on personal consumable goods, on education of children and in side-business. However, most farmers tend to invest the extra income back to agriculture either by extending more and more land under micro irrigation system or installing drips and pipes in their flood irrigated or rainfed cultivated land. In Nashik and Solapur districts, the FGDs with drip irrigating farmers reported that they increasingly brought more and more land under drip irrigation and also invested in livestock mainly in cows for milk as the latter again is a source of income to the family. On the other hand, an opinion that came from a drip irrigating farmer in Gondhanapur village of Buldana district was that agriculture, even with micro irrigation, was manageable only if it was

supplemented with a fixed income from another source. Such subsidiary income sources help the farmers face the intermittent risks which are inevitable in agriculture. In Ahmednagar district, the FGDs revealed that the farmers mainly invested renovating their houses or extending their land under drip irrigation. Very few farmers reportedly bought tractors but many bought two wheelers. In Satara and Vidarbha regions, farmers mostly invested their profits back in agriculture. Although not everybody could afford drip, farmers in Vidarbha region invested in at least one sprinkler set.

The FGDs conducted with wives of drip irrigating farmers across the nine districts were however unable to generate much opinion about the higher income obtained due to drip irrigation and with regard to investing them as most of them were shy and were not aware of the contributions of drip irrigation. Most of the women said that they prefer to cook for their family and go to the field only during the sowing period. Very few of the participants were able to share openly how they invested the additional income got after using drip system. And some women belonging to the Marwadi community in Akola's Vidarbha region never ventured into the fields and they mostly remained in the household.

The emphasis on education was clear in most villages, where priority was given to education of children. Most farmers revealed that they would be happy if their children could do farming, but preferred them getting gainful employment because according to them farming was uncertain, insecure and required painstaking efforts. The FGDs conducted with the wives of drip farmers also revealed similar opinions as they felt that their children should get a regular employment where they get assured income and they will not have to slog themselves across the year.

The FGDs among both the drip irrigated farmers and their wives across nine districts revealed that most of the children nowadays are not interested in pursuing agriculture and it is not seen as an assured source of employment. Some of the drip irrigating farmers who had more than one child said that they preferred only one child who is poor in studies to remain in agriculture while others should pursue a government job. Although we found many farmers with graduate degrees in the villages, an FGD with a group of young men in Jalgaon's Hirapur village admitted that it was due the lack of gainful employment or due to their failed efforts to get a job in the city that made them to remain with agriculture. A case study of a young progressive farmer in Akola's Dhanapur village also said that despite completing his graduation successfully, he was unable to find a decent job and therefore he remained with agriculture. He said that he does not have an occupation as he did not considered his involvement in agriculture as an occupation even though it gives him an annual income.

Insights from Field Visits around Jalgaon

During the course of the study, the study team visited JAIN Company (Jain Agro-park and Jain plastic-park) a number of times and in each time they were taken to a few villages in Jalgaon district. The team had visited villages in Erandol, Parola, Raver and Bhusaval talukas and had on the spot dialogue with farmers who adopted drip irrigation, contract farming, tissue culture and the like. They also visited fields to see for themselves the growth of and yield from plants like cotton, banana and onion, especially of tissue culture plants such as banana and onion. The farmers with whom the team had interaction included not only large farmers but also small and marginal farmers who also cultivated other crops like jowar, soya bean, tur dal, gram, and the like as main crops and/or as rotation crops. Many large farmers admitted that they not only possessed large land but also irrigated them with drips. Some farmers have also leased-in a large area of land, because in some families the persons were employed elsewhere and their land was available for cultivation by others.

The farmers generally felt that they could get more yield due to drip irrigation, and much more with tissue culture plants and contract farming. In a village Jarandi in Jalgaon, it was seen that farmers with even one acre of land has adopted drip irrigation for cotton crop and practiced all modern techniques like fertigation and he got an average of 22-25 quintals per acre. Due to the adoption of a combination of these methods their income has multiplied and they could construct better houses, have modern goods in their homes, could possess two-wheelers and four-wheelers, increase out-door activities and entertainments, better educate their children, and also buy more and more land for increasing their profitability. However some farmers also revealed that despite better yield due to adoption of drip irrigation, their agriculture is not fully secured due to various factors like draught and insufficient ground water, unseasonal and heavy rains, load shedding, unusual pest attacks, non-availability or high labour cost, and above all fluctuations in and sometime very low price for their produce. So, invariably many farmers, especially medium and large farmers, tend to have some other income generating activities as well for their income security like having dealership for fertilizers and other equipments needed for farming. As such for many farmers it is not only the farming specifically drip farming that has made them prosper but also the side-business (or additional activities) that have contributed substantially to their prosperity. Some farmers in village Jarandi said that, it was their side-business that sometimes fetched more income for them than their own farming activities.

The farmers also revealed that they provided higher education to their children whoever had shown more interest in it. Among the farmers contacted, all invariably revealed that one of their sons often whoever was weak in studies looked after agriculture and others became engineers, doctors and the like and employed or practicing elsewhere. Nonetheless, drip irrigation has made a revolution in many villages towards increasing agricultural productivity, giving more

income, adapting modern agricultural techniques and contributed to social changes for the individual families. Many villages have village cooperatives that give loan to farmers at nil or low interest rates that have motivated them to install drips, cultivate commercial crops and earn more income like the ones the team witnessed in Jarandi and Girodha villages. These village cooperatives also ensured that the farmer is not taxed with the burden of selling his produce in distressed and some cooperatives pool the yields, locate a buyer and then sell the produce for good price. For example, in some villages, the cooperative executives said that most of the bananas are sold to buyers from Delhi who come here with trucks and loads huge quantities of banana and sell it at the sabji mandar there. In general the village cooperatives encouraged farmers to take up agriculture as a profession and ensured maximum income for them.

Government Apathy

TISS team observed that rural areas are neglected by the government. The populace also has not much say in deciding government policy. Hence there is individual progress but public utilities are in bad condition. In most of the villages the team had visited, the condition of the villages in terms of better road connectivity, public transport facilities, sanitation, toilet facilities and the like are very poor and they looked like the old traditional Indian villages in spite of rich individual family incomes. A few villages even looked like town-like appearance with big houses and building but again basic infrastructure facilities were found very poor. When asked why the residents especially the large farmers did not do something for the betterment of the village, they replied that they approached the government functionaries many times but still the agencies were not doing anything. Thus, on one hand we could see a rejuvenation of individual families partly due to drip irrigation but on the other hand there was a near absence of an overall village development and so we need to go a long way in achieving a holistic rural development.

CHAPTER 1

The Jain Irrigation Systems

Agriculture is the backbone of the Indian Economy. Day by day the Indian population is increasing and therefore the food requirements are also increasing. But at the same time the arable land area is decreasing because of increasing demand for housing and industrial requirements

and decreasing water availability for agricultural use. Hence, there is a need to increase the agricultural productivity of different crops for the food security of the nation within the available arable land by conserving water and adopting modern agricultural practices. With flood irrigation there is over irrigation or excess use of water and as a result the soil becomes saline/alkaline but at the same time the flood water, sometimes, especially when water scarcity periods, does not reach the other end of the field and/or the root zone of the plants. Further part of the water is lost due to evaporation and seepage and as such only part of the water is used efficiently. These types of problems can be tackled by judicious use of the available water and by adopting innovative irrigation systems such as drip and sprinkler irrigation. These modern irrigation methods are adopted to ensure maximum yield with better quality of the produce and thereby contributing to the food security of the nation.

Drip irrigation is sometimes called trickle irrigation and involves dripping of water onto the soil at very low rates (2-20 litres per hour depending on the type of crop) from a system of small diameter plastic pipes fitted with outlets called emitters or drippers. With drip irrigation, application of water is more frequent (usually every 1-3 days) than with other methods and this provides a favourable and very high uniform moisture level in the soil in which plants can have a healthy growth.

Against the backdrop of the rapid decline in the irrigation-water potential and low water-use efficiency in the flood (conventional) method of irrigation, drip and sprinkler irrigation, or in general, micro irrigation systems (MIS) have been introduced recently in the Indian agriculture. In order to popularize the MIS, the central and state governments are providing subsidies to

farmers who install MIS in their agricultural fields. Of late the governments have increased the subsidy from 50 percent to 75 percent or even higher.

There are a number of micro irrigation system manufacturers in India and of them Jain Irrigation Systems limited (JISL or simply JAIN) is one of the oldest and major players. The JISL is not only manufacturing and supplying micro irrigation products but also helping the farmers to find solutions to their agricultural problems in terms of campaigns and training programs. Now the JISL has grown into a multinational company and is becoming an important contributor to the Indian agriculture and food security. This report revisits the contributions of JISL as a total solution model for modern agriculture that deals with water, soil, crop management, marketing of produce, value addition, and to assess the nature, extent and process of social, economic and psychological transformation in the life situation of farmers. It is made clear here that the purpose of the report is neither to praise JISL nor to underestimate the contribution of other micro irrigation system manufacturers but only to look at the socioeconomic impact of micro irrigation systems in general and the contribution of JISL towards this end in particular.

With the hunt for affordable micro irrigation technology began in the country, Shri. Bhavarlal Jain pioneered water management in agriculture through micro irrigation system as early as in the 1980s. However, the very first industrial business which the Founder Chairman of JISL started was of Papain IP in 1978 which was using indigenous raw materials (latex of Papaya) processed with equipment and technology from abroad and a final product highly refined Papain IP, which was a 100 % export oriented product. In this venture the objective was to produce from indigenous raw material a value added world class product that had demand world over. Later he diversified his businesses to include PVC pipes and sheets, poly ethylene pipes, drip and sprinkler sets, tissue culture plantlets, green houses, processing of fruits and vegetables, solar energy products and many more under the Jain Irrigation Systems Limited (JISL) with headquarters in Jalgaon, Maharashtra. Thus, JISL has been working for the agriculture development in India and world over for the past four decades with an objective to enhance farm productivity that helps to make agriculture a sustainable business. A brief glimpse about the various activities of the JISL is elaborated here.

1.1: Drip and Sprinkler Irrigation Systems

JISL introduced drip and sprinklers that are suitable to Indian agriculture through their integrated system approach which includes indigenization of drip and sprinklers to suit India's small farmers and varied climatic conditions, together with, service support for products, strong agronomic product to farmers and system demonstration trough field research and development. In drip irrigation applications, drip systems carry a precise and on-demand quantity of water

and fertilizers through a network of pipes and emitting devices to the roots of each plant helping to reduce water requirements and enhance crop yield. When it comes to sprinkler irrigation, it is a method of applying irrigated water in a manner similar to rainfall.

Water is distributed through a system of pipes, usually by pumping, and then sprayed on to the air, saturating the ground with small water drops. Sprinklers can provide efficient coverage for

both small and large areas and are suitable for a wide range of crops and irrigable soils since they are available in a wide range of discharge capacities. Some of the advantages of the drip and sprinkler systems are saving of irrigation water, saving of energy for pumping, efficient fertilizer and chemical application, improved pest and disease control, reduced weed growth, reduced labour costs, maintaining soil health, enhanced crop yield, improved quality of the produce and in difficult land terrain, and has proved to be ideal for marginal lands and inferior quality waters.

The seeds of change were slowed by JISL in the 1980s for the second green revolution in India. While the first green revolution contributed to degradation of soil due to the excess dependence on chemical fertilizers, the second revolution contributed to the conservation of soil, wa-

ter and environment. This technology has changed the lives of not only large farmers but also many small and marginal farmers in rural India and it has demonstrated the potential to transform the whole of rural India. In the state of Maharashtra alone, the company covered a total of 36.5 thousand hectares of land under drip irrigation by 2006-07 and the area progressively increased to 180 thousand hectares by 2010-11. Based on the statistics it can be said that the company has achieved on an average a fifty percent increase in drip irrigation products per year

during the recent period. Under sprinkler irrigation also, in Maharashtra, the company covered a total of 17.3 thousand hectares of land in 2006-07 and it increased to 91.5 thousand hectares in 2010-11 (Statistics as per Jain Irrigation Systems Limited). A similar progress was made in the other states of India as well but the highest contribution was in Maharashtra state.

1.2: PVC Pipes

In the 1980's JISL ventured into manufacturing of PVC pipes under the brand name *JAINPIPE* and started supplying the product to farmers in Maharashtra, Madhya Pradesh, Gujarat and Karnataka. Soon, due to good quality, the brand was established as a reliable one with premium valuations. The PVC pipes were the precursors to the drip irrigation system. It can even be fair to say that drip irrigation would not be possible without PVC pipes. Before the popularisation of PVC pipes, farmers practiced furrow irrigation i.e. water was directed from the source to the field through small channels dug in the land itself. So, it goes without saying that such type of irrigation led to high wastage of water through seepage and evaporation. There were also several problems created by stagnation of water in the furrows. Water borne diseases like cholera spread through these furrows. These furrows also became breeding grounds for mosquitoes. Furrow irrigation also needed a lot of labour input causing all of the family members including children to work on the fields. This led to their education being neglected.

After furrow irrigation came the age of cast iron (CI) and ductile iron (DI) pipes. But metal pipes were so expensive that not everyone could afford them. Also it got rusted over a period of time. It was only with the advent of PVC pipes, together with its cost reduced to a third of the cost of CI and DI pipes, that everyone from large to small and marginal farmers stopped the practice of furrow irrigation and shifted to PVC pipes. With PVC pipes installed, the water being wasted was reduced by 50%. This means that farmers earlier used to pump double the water than that they needed with PVC pipes. The carbon footprints left by PVC pipes are much less than that left by metal pipes. Thus PVC pipe is a classic case of saving non-renewable energy using non-renewable by recyclable product. Another benefit is that whereas canal irrigation can irrigate land below the reservoir and not above it, PVC pipes can take water to both the areas. However, a fallback of the PVC pipes is that it is not conducive to open air use and it has to be used underground.

1.3: Tissue Culture

In the early 1990's JISL conducted an extensive survey to select a crop beneficial to propagate through tissue culture before entering into this business. Tissue culture is a technology of propagating plant cell/organ or tissues on an artificial nutritive growth medium under controlled condition to propagate complete plant which is true to their mother plant.

The technology offers round the year propagation since the activity is carried out under controlled condition. The significance of this technology is that a large number of plantlets can be

produced in a small space within a limited time period. The produced progeny is genetically pure and true to their mother plant and is free from diseases. The company has selected banana as a crop from horticulture group for propagation through tissue culture considering the demand and scope for its improvement. The tissue culture laboratory of JISL is the biggest for banana in the world, nestled in the largest banana belt of the country (48000 ha), Jalgaon, and is also known as the Banana Bowl of India. Only three talks of the district, that is, Raver, Bhusawal and Yawal constitute 72 percent of the banana cultivated area of the state accounting for a major share in the total production of India. Currently JISL is the only innovative enterprise in India producing over 30 million plants of Grand Nain variety of banana per annum. In other crops, it propagates sugarcane, potato, onion, pomegranate, ginger and turmeric. While onion and pomegranate are propagated on commercial scale, sweet orange and guava are under research. JISL sells tissue cultured plantlets in Maharashtra, Gujarat, Karnataka, Madhya Pradesh, Andhra Pradesh, Tamil Nadu, Chhattisgarh, Manipur, Assam and Nagaland.

The significance of the tissue culture plantlets is that the plantlets are disease free (and not disease resistant), ensures uniform growth, genetic uniformity and produces early and high yield. Thus JISL supplies disease free plantlets to farmers ensuring them a higher and early yield and these changes the lives of farmers with a higher income at every harvest. The company has sold more than 6 million tissue culture banana plantlets in the year 2006-07 and it has grown to 15 million in the year 2010-11 (from JISL statistics). Correspondingly, the tissue culture banana has assured the country a contribution of 4 lakhs MT per year to the food security of the nation.

1.4: Jain Food Processing

JISL manufactures dehydrated onion, vegetable products and aseptic fruit purees, concentrates, clarified juices, and frozen products of finest quality, and market them internationally under their brand name FarmFresh. It has the most controlled modern, world class fruit processing facility at Jalgaon in Maharashtra, Baroda in Gujarat and Chitoor in Andhra Pradesh. It process selected varieties of banana, guava, mango, pomegranate, amla (Indian gooseberry) and tomatoes that are brought either through contract farming system of the company or directly from open markets. These value addition and assurance of prices incline the farmers towards initial investment and modernization of their agriculture practices. Large MNC's like Coca-Cola, Nestle, etc purchase the fruit purees, pulps and concentrates from JISL which shows the quality and hygiene maintained in production by the company.

1.5: Contract Farming

JISL has started a state of the art onion and vegetable dehydration plant in Jalgaon in 1994. It is a 100% export oriented unit. It has food processing units elsewhere in the country as well. The

Jain Irrigation Systems Limited (JISL) forged mutually rewarding relationships with farmers to feed the food processing factory through a unique and rewarding contract farming arrangement with more than 3000 farmers, especially with small and marginal framers for growing and supplying white onion. In the arrangement, the company provided high yielding onion seeds, MIS equipments, agronomy advice and buyback arrangement with minimum support price or market price whichever is higher. JISL is said to be the first organization to introduce altogether a new and improved (high TSS & pungency) white onion variety. This enabled the farmers to take 2 crops in one year. The company purchased about 85 thousand tons of white onion in 2010-11 from its contract farmers in order to process it into dehydrated powder and export it.

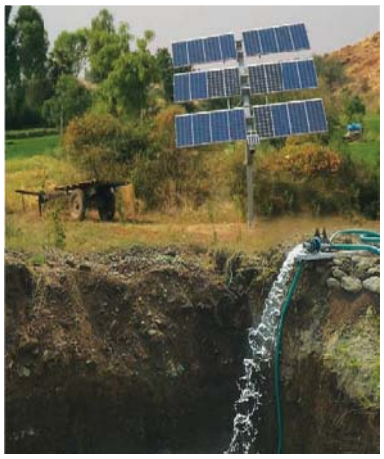
The company procures onion and fruits not only from the contract farmers but also from the open markets for processing in its food plants. The company buys Alphanso, Totapuri and Kesar mangoes mostly from Chitoor district in Andhra Pradesh where the farmers are trained under the Jain good agriculture practice norms (JAINGAP). Under the program the farmers are given information regarding micro irrigation, fertigation and harvesting fruits at the most appropriate

time. Area covered under JAINGAP mango farmers is about 3700 acres. As a result of fair practice & transparency, growers supply their mangoes to the Jain fruit processing plants in Chittoor. The company also buys tomatoes, amla and guava from both the farmers and the open markets as per their requirements. The company has processed a total of 1.2 million tonnes of various fruits valued at Rs. 2.13 billion rupees in the year 2010-11 alone. All the foods processed are exported to other countries thereby contributing a good amount of foreign exchange to the country.

1.6: Renewable Energy

In developing and less developed nations, fossil fuels are exploited to any extent today and that makes lots of foreign exchange also for them. JISL has shown two ways to explore the abundantly available renewable energy and to overcome the scarcity of electricity in remote areas. As part of its environment-friendly projects, JISL has diversified into solar and bio-energy activity profiles. In India about 52 per cent of the total electricity is generated using fossil fuel (coal). Indian agriculture consumes about 30 per cent of its total electricity. However our rural farmers are still facing acute shortage of electricity and are unable to run their pumps for the required duration to fulfil the requirement of their irrigation. This results in rotational irrigation with the rotation period ranges anywhere from a few days to a few weeks. Due to prolonged rotational periods, plants/crops do not get water as per the required seasonal requirements. As a result the growth of crops suffers and yield reduces. In order to get over this problem, JISL recommended the use of solar pumping systems to its farmers. Here, the idea is to couple the solar pump with the drip irrigation system. In such a case, the farmer is not dependent on grid-power for irrigation. He can run his pump using this abundantly available renewable energy during day time & irrigate his crop and also reduce the use of fossil fuels for electricity thereby reducing the Greenhouse gases (GHGs) emission.

The solar pumping system comes under the branch of Photo voltaic technology. Solar pumping system is designed in such a way that, as the sun rises the system starts operating. Initially in the morning hours when the sunshine intensity is relatively low, we get lower discharge through the drippers. But it is not a problem because at this time the evaporation of water is less. In the afternoon hours, when the sunshine intensity is relatively high, the pumping system delivers higher discharge. Hence under the inadequate and intermittent grid power situation, the solar pumping system with drip irrigation can be a better combination for maintaining



a favourable soil moisture condition for the proper growth of the plants.

The JISL has pioneered in developing this solar water pumping system which contributes not only agricultural growth but also conserves grid energy that will have a huge impact on the overall power scenario in India. However as of now the sale of solar pump sets is not substantial to report statistically but it is hoped that it will pick up in the coming years. Apart from the solar pumps, JISL also manufactures solar lanterns, solar power systems and Solar street lights which of course help in remote areas to overcome the darkness. They also manufacture solar water heating system which can also be used in case of hard water. There is also evacuated tube technology for the same purpose.

As a result of the food processing, a large quantity of organic agro waste like fruit peels, rotten fruits, discarded puff purees is generated at the Jain Food Processing facility that has led the company to set up a Bio-methanation plant. The plant is generating 1.7MW gross power (through 2 x 834 KW, GE Jenbacher make engines) which is grid interactive captive consumption purpose. Not only the plant converts the biomass wastes into energy but also it replaces the use of fossil fuels that would have been used for power generation in the absence of the Plant. This plant currently ensures treatment of nearly 200 tons of organic fruit wastes which is otherwise a serious concern to be addressed. Another waste management practice at Jain Food Park is composting and vermi-composting of solid waste. However, in order to utilize the calorific value of the waste, the company has decided to go in for the Bio-methanation of the organic waste. As fruit processing plant is season-based Press Mud Cake (PMC, filter press waste from sugar industry) is utilized to fulfil raw material demand and the power generated by the Plant replaces at least partly the power consumed from the State power grid.

1.7: Jain Green Houses

In conventional Agronomical practices, the crops are grown (cultivated) in the open field under natural conditions where the crops are more susceptible to sudden changes in climate such as sunshine, temperature, wind, rainfall and snowfall and further affected by human, animal, birds and insects. Green Houses are just like large houses with walls and roofs made of transparent materials wherein crops are grown under artificially controlled environment and other conditions viz. temperature, humidity, light intensity, photo period, ventilation, soil media, disease control, irrigation, fertigation and other agronomical practices throughout the season irrespective of the natural conditions outside. Jain Green Houses are built of GI structures that have a variety of applications, the majority being, off-season growing of vegetables, floriculture, planting material acclimatization, fruit crop growing for export market and plant breeding and varietals improvement. Jain Green Houses are available in different sizes and constructed as per customer requirement. The sizes vary from as small as 100 Sq. M to 10,000 Sq M and even more. The degree of sophistication also varies from a simple polyhouse with polythene sheet covering to a highly sophisticated, fully automated systems with Poly carbonate sheet roofing (double walled), PAR lightings, boom irrigation, rolling benches and full scale computerized (fully automated) systems. Thus the Jain green houses are highly efficient and they increase the yield 5 to 15 times and they can even be used for the production of roses, carnation, cut-flowers, plant propagation, raising of seedlings, primary and secondary hardening of tissue cultured plants and production of rare plants, orchids/herbs and medicinal plants.

1.8: Village Rejuvenation Efforts

The management of JISL is committed to the betterment of the society through their Gandhi Research Foundation (GRF) where it has collected all Gandhian books, documents, photographs, films, speeches and artifacts in printed as well as in electronic/digital formats and facilitate Gandhian studies through formal (by conducting diploma, degree and doctoral as well as post doctoral courses) and informal (camps, seminars, padyatras, etc. channels of education) activities. It also works towards the promotion of Gandhian constructive action programs including rural development through rain-water harvesting, collection, storage and efficient distribution, use of renewable energy, measures for women empowerment, vocational education, Panchayati Raj, etc. Gandhi Research Foundation has adopted six villages from its neighbourhood for rural development work including educational, health, village development and sanitation works.

The management of JISL has established some Schools and Colleges and of them a few notable institutions are: (1) **Wakod**, the birth village of the founder, has been particularly fortunate in that it has been the nerve centre of many charity initiatives. A **higher secondary school** at Wakod is a paramount example. It is a co-educational school with over 1100 students. (2) "**Anubhuti"** is a co-educational, residential, English medium school affiliated to the Council for the Indian School Certificate (CISC) and following the ICSE syllabus. The school commenced operation in July 2007 and by March 2011 it has presented its first batch of students for the Class 10 exam and recorded 100% first class with 88% distinction. In the academic year 2011-12, Class 11 is being added. At present it has a student-strength of 250. It maintains a teacher student ratio of 1:8. It is a not-for-profit school and generous scholarships are awarded to deserving students. (3) **"Anubhuti" (2)** is scheduled to open in July 2011. It is reserved for children of economically backward section. It primarily works with the surplus generated by the "Anubhuti" residential school. This school is being run on free of cost basis. Admissions will be on merit basis. (4) At Chandwad, Nasik district, Sow. Kantabai Bhavarlal Jain College of Engineering and the Hiralal Hastimal Jain Brothers Polytechnic are doing yeomen service to the region. Also it runs a few primary schools.

Training programs are offered to agricultural officers of State Government/Banks and farmers of other states/countries. New associates are given orientation programs and existing ones are given refresher courses. JHAI has been recognized as a research centre by many universities in India and abroad. Jain Research and Development Laboratory at Jain Hills is an internationally comparable lab accredited by NABL and recognized by the Department of Science and Technology, Government of India. It undertakes intensive high end basic research in order to develop new varieties of horticultural crops and improve on the existing ones.

1.9: JISL as Multinational Company

Now JISL has grown into a multi-national company with factories and/or business establishments in different states within India and in different countries like United States, United Kingdom, Switzerland, Israel and many Asian and African countries. JISL is a major agri-business player internationally and the single most major player in India with "One stop shop" for various agri-products and also for exporting PVC pipes and sheets, drip irrigation sets, sprinkler, tissue culture saplings, green houses, solar products, processed foods and dehydrated vegetables. All products are having ISI and ISO standards certificate which make it easy to compete in the world market. The JISL had a turnover of Rs. 518 crores in 2010-2011 only from their exports (from JISL statistics). JISL is the largest exporter of Drip/Micro Irrigation components and systems in India. In addition to micro irrigation systems they have developed Plastic Sheets, Knobs,

Windows & Doors, valves and other products for exports. Brand building has been a part of the company's overall strategy. "EX-CEL" brand of Plastic Sheets & "JAINS, INDIA" brand of Drip /Micro Irrigation Systems & components from JAINS, Jalgaon, India has place of its own in the European, African, Asian and US Markets. Presently JISL is exporting to more than 105 countries in 6 continents. With acquisitions in many countries of different continents of the world the JISL company is now serving the farmers not only in India but also worldwide. There would be but a few Organizations in the field of Agriculture like JISL who have developed such a deep understanding and respect for the relationship between land, water, soil, crop and above all, environment. Jain Irrigation has an enviable track record for developing down-to-earth solutions for farmers by way of technology transfer and makes them progressive. At the root of all these activities and achievements is the personal and organizational commitment to the upliftment of farmers at large. It has taken up village rejuvenation projects as a part of service to society and to address socio-economic impact in a variety of humble manners.

Thus JISL's is a unique business model where the belief that development of mankind impacts and in turn is impacted by the environment, is firmly reflected through the company from its diversified product portfolios and the way they engage with their stakeholders. In an effort to keep the technology affordable and accessible to small and marginal farmers JISL has evolved a medium to long term strategy that is ready to pass on benefits to the customers in product prices, specially to underprivileged ones but seldom increases the pricing burden on the same class of people. This amply demonstrates the place small and marginal farmer have in the company's strategy for business growth over the years. Jain Irrigation Systems Ltd in India provides direct employment to about 8000 persons at different levels and indirect employment to about 10 times higher in the form of contractors, transporters, dealers and persons employed by them for marketing and services of JAIN products.

CHAPTER 2

Study Design

The Jain irrigation system limited (JISL), Jalgaon approached the Tata Institute of Social Sciences (TISS), Mumbai to have an overall assessment of the impact of the micro-irrigation system (MIS) in general and of JISL in particular on the socioeconomic rejuvenation of the rural community, particularly the farmers. Accordingly a study was undertaken in the state of Maharashtra where the penetration of micro-irrigation system was stated to be one of the highest in India. It is to be noted that the study does not look in to the technical aspects of the micro-irrigation system (and TISS is not competent either) but rather focuses on the contribution of adoption of micro-irrigation system on the socioeconomic life of the people. The study relied primarily on the perception and experiences of a cross-section of the rural community (farmers and agricultural labourers, or landholding and landless households) distributed across the state of Maharashtra.

2.1: Objectives

The objectives of the study were to:

1. Document evolution of Jain Irrigation as a total solution model that deal with water, soil, crop management, marketing of produces, value addition, and general process of change.

2. Assess the nature, extent and process of social, economic and psychological transformation in the life situation of farmers who have been part of the Jain irrigation model.

3. Assess the nutritional status, school retention and progression and achievement of children; and nature of changes gender relations in families.

4. Identify *Pathway to Sustainable Development and General Welfare Creation* at household and community levels through Jain Irrigation systems:
   - diversification of economic opportunities and employment at the village level
   - impact on environment and climate change
   - impact on migration and livelihoods
   - feeling of well being

5. Identify *Pathway to Create Jain Irrigation System as a* model for addressing agrarian distress and transformation to sustainable development.

2.2: Components of the study

2.2.1: Sample survey of households

The sample household survey covered a sample of drip irrigated farmers (households), flood irrigated farmers (with no land drip irrigated), rain-fed cultivated farmers (with no land irrigated) and landless (other than cultivated/irrigated) households on the following aspects as appropriate.

1. Socioeconomic background such as religion, caste, housing, toilet, water, fuel, and possession of modern household items.
2. Individual household member details such as sex, age, marital status, education, schooling of children, and economic activities of members and households.
3. Births in the household in the recent past, to assess birth rates, institutionalization of deliveries and infant mortality
4. Morbidity among household members in the past one year including hospitalization, work/study interruption and cost of treatment.
5. Nutritional status of vulnerable groups namely children below 5 years, adolescent males and females (13-19 age group) and women of reproductive ages (15-44).
6. Landholding pattern of households including irrigation and drip/sprinkler irrigation.
7. Details regarding installation of drip/sprinkler sets including manufacturer, cost, subsidy, area under drip/sprinkler and duration of use.
8. Crops cultivated (seasonal, annual and perennial crops) in the past one year including area under cultivation, seed/sapling used (with particular reference to tissue culture), item-wise cost of cultivation, and quantity and value of yield obtained.
9. Sale of crops including when, where, nature of transaction (with particular reference to contract farming), interval between harvest and sale, sale price, etc.
10. Experiences with drip/sprinkler including choice of brand, training received, maintenance problems if any, assistance/help/support received from drip supplier, change of crop after drip, perception about reduction in labour, water and electricity requirements, etc.
11. Awareness and knowledge of non-drip farmers about drip/sprinkler, advantages and disadvantages of drip irrigation, awareness about subsidy, awareness about dealers in

nearby area, reasons for not installing drip, and intention to install drip in the near future.

12. Perception of farmers about younger generation in general and their own children in particular in taking up agriculture as their profession.
13. Livestock position including income from livestock.
14. Food and non-food expenditure on various items.

2.2.2: Focus Group Discussions

Focus group discussions (FGDs) with farmers in general and drip irrigated farmers in particular about various aspects of their experiences with agriculture in general and drip irrigation in particular, were conducted. The FGD groups included drip farmers, wives of drip farmer and young men aged 19-35 years.

1. Ten FGDs with drip irrigated farmers were conducted to understand the progressive nature of the farmers in modernizing agriculture, crops chosen for drip irrigation, profitability of drip irrigation, progressive advancement in bringing more and more areas under drip irrigation, progress in their socio-economic status, and changes in their lifestyles.
2. Five FGDs with of wives of drip irrigating families were conducted to know the changes in their lifestyle and their involvement in household management and decision making after adopting drip irrigation (due to the expected increase in household income and related social status and lifestyle).
3. Three FGDs were conducted with youths of farmers to understand their future aspirations and their interest in taking agriculture as their profession.

2.2.3: Progressive Farmer Case studies

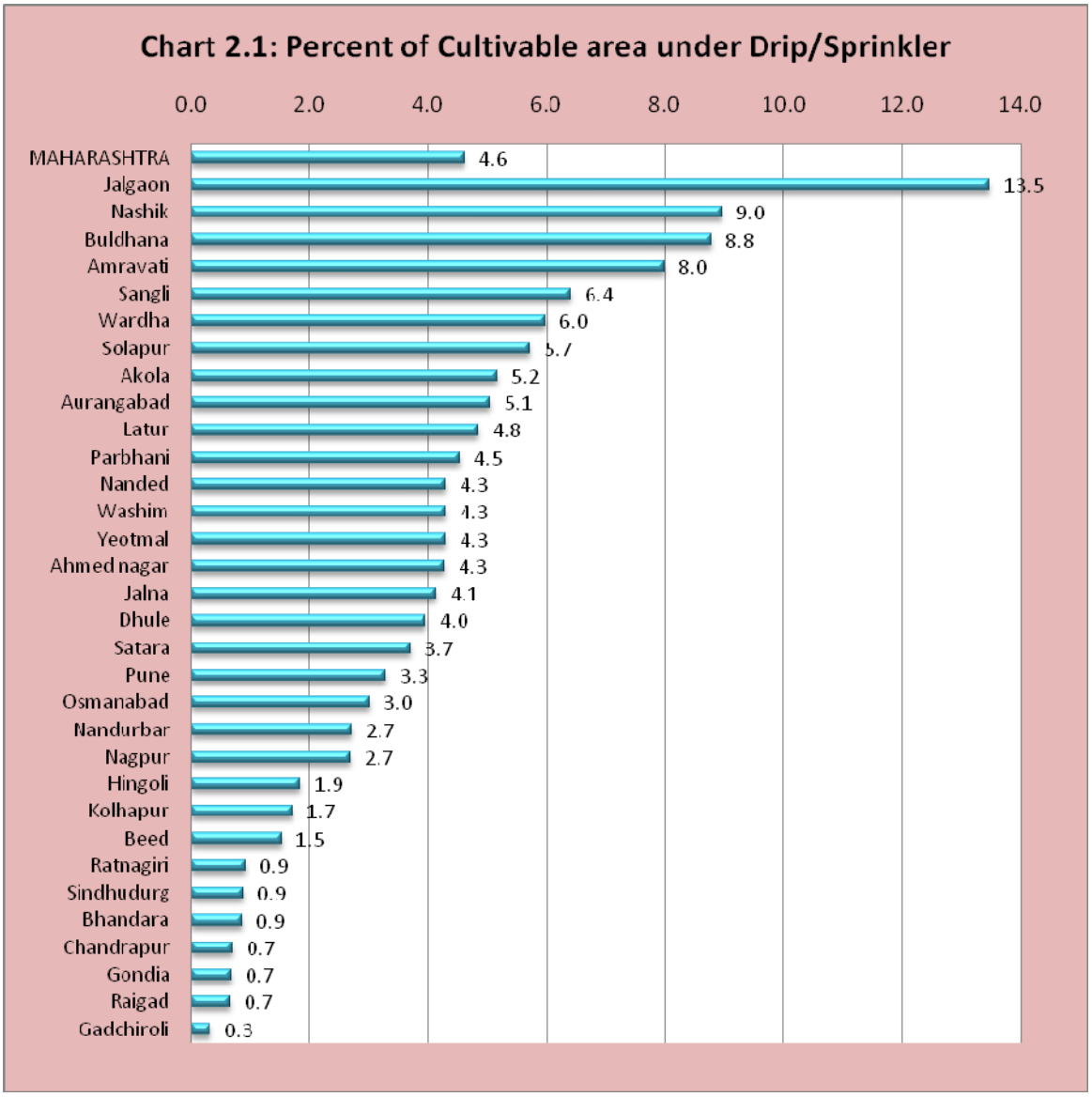
Farmers who first adopted drip irrigation in the village and farmers who installed drip in maximum area, farmers who reported very high yield after adopting drip irrigation and farmers who received awards and/or invited to institutions to share their drip irrigation experiences, were contacted and interviewed in depth to document their experiences.

2.2.4: Village Case studies

Selected villages with a large number of progressive farmers particularly drip irrigated farmers were identified in the selected talukas and their experiences and achievements were documented.

2.3: Sampling of Households

As per government statistics presented in table 2.1 (Chart 2.1), the overall drip/sprinkler penetration (drip/sprinkler area to total cultivable area) was below 5 percent (4.6%) in Maharashtra in February 2011. However it was as high as 14 percent in Jalgaon district and as low as 2 percent in as many as 11 districts. Further, required statistics on drip irrigation below district level was not available, or not accessible to the study team. Specifically, village-wise drip statistics was not available for village selection on the basis of drip penetration. So with a view to getting adequate number of drip irrigated households from within a reasonable number of villages and to generalize the findings of the survey we have adopted the following procedure.



The study is designed in such a way that it provides estimates of drip irrigation related parameters for Maharashtra state as a whole (except the 11 districts where the drip penetration was reportedly very low). It will also provide for comparison of drip irrigation with flood irrigation and also with rain-fed cultivation. Further the study will indicate the penetration of drip/sprinkler by 'Jain Irrigation system' as compared to other players in this field and also the relative advantages of Jain drip sets with that of other drip sets. Though different regions of Maharashtra are at different levels of drip irrigation and some are at very low levels the study could not be designed to provide regional estimates or assessments.

With a view to having adequate number of drip irrigated households within a reasonable number of sample villages (so as to minimize the cost of the survey), we have adopted a multi-stage-stratified probability proportionate to size sampling procedure with the size being the extent of drip penetration (extent of area under drip irrigation at district level and number of households with drip irrigation at taluka and village levels). Accordingly, in the first stage, the districts were divided into 5 strata based on drip density (percent of cultivable area under drip irrigation). For this purpose, the program statistics obtained from the Horticulture department of the Directorate of Agriculture, Pune (Table 2.1) was used. As Jalgaon district stood distinctly above all districts (14 percent), it was treated as stratum 1. Next, districts with a drip density of 8-10 percent were considered as stratum 2, districts with a drip density of 5.0-7.9 percent were treated as stratum 3, districts with a drip density of 2.0-4.9 percent were considered as stratum 4 and all other districts were treated as stratum 5.

It was decided to select 10 districts, distributed in each stratum in proportion to the total drip/sprinkler area in the districts of that stratum. As the number of districts worked out for stratum 5 was only one, it was decided to drop stratum 5 from the survey. Thus the total number of districts selected for the study was 9 out of the 33 districts in the state (excluding Mumbai which is fully urban). In the next (second) stage it was proposed to select two talukas from each selected district by following probability proportionate to size sampling method with the size being the number of drip installations or area under drip irrigation. To obtain the statistics required for sample selection our field supervisors visited the district agriculture offices in the selected districts but in spite of our best efforts we could not get the statistics for one-third of the districts and for these districts the assessment made by the Jain irrigation system as high, medium, low and very low drip irrigation/penetration, was used. The list of selected districts, talukas and villages is also given in table 2.2.

In the third stage we proposed to select 3 villages per taluka based on drip density or number drip installations or at least whether some households had installed drip. This was to ensure that at least a good number of selected villages had drip installation, which is the crux of the study. For this purpose we sent our listers to the selected talukas to obtain village-wise drip sta-

tistics from the Taluka agriculture office but the information were not available. Then we asked the listers to go to the villages, meet the talathi and obtain the list. In many cases meeting the talathi itself was found difficult and when we could meet we found that they did not have any statistics but rather they showed registers with long lists of farmers with details of agriculture including drip installation. Though the required information was available we found that it was extremely difficult to compile the statistics by ourselves for thousands of villages of the 18 talukas. So, we dropped this approach and instead we requested the JISL a list of villages (in each of the selected talukas) with a sizable number of drip installations made by JAIN (for JISL) or by other drip/sprinkler companies. Accordingly a list was called from the respective Area managers of JISL and was supplied to us. From this list we selected one or two villages depending on the number of villages in the list and the remaining villages (one or two) from the census list of villages after excluding the list of villages provided by JAIN, so that the total number of villages selected from each taluka was 3. That is, we only partly relied on the JAIN list and partly on the general list for the selection of villages.

In the fourth and last stage, we conducted a complete listing of all households in the selected villages identifying drip/sprinkler irrigated households, flood irrigated (other than drip irrigated) households, rain-fed cultivated (other than irrigated) households and landless (other than cultivated) households. The procedure adopted for listing of households is described in detail later in this chapter. From the list of enumerated households, all or a maximum of 35 drip/sprinkler irrigated households, all or a maximum of 35 flood irrigated households, all or a maximum of 22 rain-fed cultivated households and all or a maximum of 22 landless households were selected by applying systematic sampling procedure. The numbers were decided keeping in view that we will be able to have a minimum of 1000 households in each category and a maximum of 5000 households on the whole for the questionnaire interview. Given the budget and time constraints, the sample size is just adequate for differential analysis within categories of farmers and to estimate drip irrigation related parameters for the state as a whole (excluding stratum 5 districts) but crop-wise representation is difficult to ensure.

It is important to note that we have set a sample of maximum 35 drip irrigated and also flood irrigated households per village, because in many villages the number of drip/sprinkler irrigated households may be very less and in some villages it may be more than that, so that we would ultimately have an average of about 20 households per village for interview. On the other hand rain-fed cultivated and landless households are expected to be available in adequate numbers in most villages and so we have set a sample of 22 households per village so that we may likely to ensure 20 completed interviews. In general we expected around 1000-1200 households in each category namely, drip/sprinkler irrigated households, flood irrigated households, rain-fed cultivated households and landless households. Appropriate weights were derived and used to make the sample a representative sample for the state (excluding 11 districts).

2.4: Survey Instruments

The survey instruments consisted of a house-listing form, a household questionnaire and a FGD cum case study check list. The house-listing form was used to list all the households in the selected villages, and it served as the sampling frame for the selection of households. The list was also used to assess the extent of households temporarily out migrated (as of date of survey) for work related reasons. The house-listing operation was conducted by a set of trained house-listing investigators during mid-April to mid-June, 2011, about 15-30 days before the household survey.

The first part of household questionnaire elicited information on household characteristics, details of household members, details of persons studying and persons working, births occurred since January 2006, major illness among household members and nutritional status of children (born since January 2006), adolescent boys and girls in the age group 13-19 and ever married women of reproductive age 20-44 (with the age group 15-19 covered under adolescents). The nutritional status assessment included measuring height and weight for all and mid-upper-arm circumference for children and adolescents. However height was not measured for children below 12 months and measured for children age 12-23 months only if the nutrition investigator satisfied that the child could stand properly. It was because we could not use length measuring board. The second part of the questionnaire elicited information on landholding, irrigated holding, drip/sprinkler installation details, seasonal and horticultural crop cultivation, marketing of agriculture produce, crop failure, drip/sprinkler experiences, livestock position, and household expenditure on food and non-food items.

2.5: Data Collection

A number of house-listing teams (6 teams) with each team consisting of two or three house-listers, and a supervisor for all the teams combined, visited the selected villages, and listed the households. Later the supervisor selected sample households from the list of households by applying systematic random sampling method.

The household questionnaire was administered by a team of field investigators to the head of the household and spouse, and/or other responsible members in the household. Emphasis was made to have the interview with at least one male and one female responsible member preferably head of the household and spouse together so that information on all parts of the questionnaire is captured more reliably.

The data collection was completed with 5 survey teams; each team consisted of a field supervisor, a female health investigator, 2 female investigators and 3 male investigators (total 8 members). Each questionnaire was edited by the field investigators in turn and doubts if any were cleared with the respective investigator, and corrections if any required were carried out in consultation with the respondents while the team was in the village itself. The field supervisors coordinated the field work of their respective teams.

In addition to questionnaire interview, focus group discussions (FGDs) with different categories of people in the villages were also conducted. FGDs were conducted for Drip/sprinkler irrigated farmers, their wives, youths of farmers, and landless households. In addition to FGDs, case study of progressive farmers and dealers of drip systems were also conducted.

As and when the field work was completed in a village, the filled-in questionnaires were brought to Mumbai and entered into computer using a special software called "Census and Survey Processing System" (CSPro). This software is useful for entering, editing and tabulating data from censuses and/or surveys and is used worldwide in large scale surveys.

2.6: Schedule of Training and Field Activities

The survey preparations started in February 2011. In March 2011 the survey team (Project Directors and Program Officers) visited and had a meeting with executives of Jain Irrigation Systems limited (JISL) in its headquarters at Jalgaon and broadly identified the issues to be addressed and the study modalities. It was decided that the study would be conducted in Maharashtra state and the sample be drawn representing different geographic regions and covering different crops.

The house-listing training was conducted for 3 days during 18-20 April 2011 at TISS campus, Mumbai. For the first week the houselisters were sent to the taluka places to collect the drip statistics for sampling. The house-listing operation started immediately thereafter and completed by the end of June 2011. The training for survey teams was conducted for 2 weeks during 2-11 May 2011 in the TISS Rural Campus at Tuljapur. Thereafter we had a one day pre-fieldwork briefing session for the field staff on 16th May at Satara, and on the same day survey teams was formed, survey materials and tour program distributed and the teams were sent to different field locations as per tour program. To start with all the field teams were allotted each one village in Satara district so that project officers could have close interaction with all the survey teams. Further in the first three days (17-19 May) dummy villages were selected (other than villages selected for the actual survey) and the teams were asked to interview some households in those villages so that they gain more acquaintance with the questionnaire in

their actual field environment. The actual survey work started on 20th May 2011. After completion of the field works in Satara the teams moved to Solapur and Osmanabad districts. Then they were sent to different districts.

The data entry training was conducted for 3 days during 6-8 June 2011 at TISS, Mumbai, and practice data entry started immediately thereafter. The actual data entry work started on 10th June, 2011.

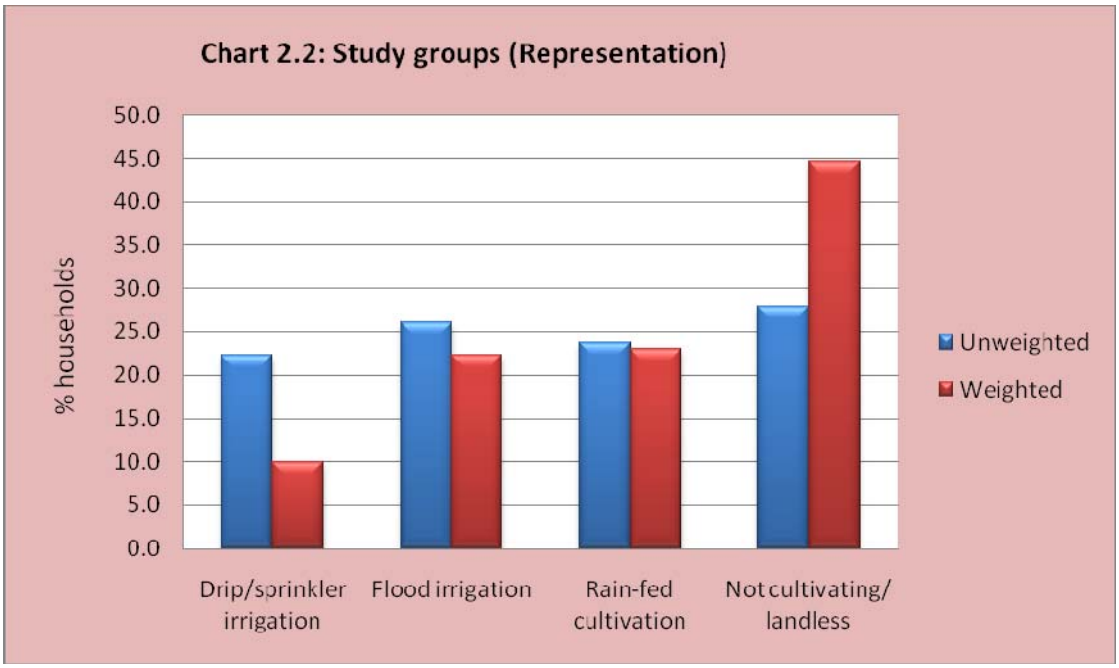
During the course of field work the program officers stayed with the survey teams most of the time and guided the teams in effectively conducting the survey. The project directors also visited the survey teams several times and guided them in the field work. In addition, two review meetings were conducted one at Satara after a week of starting the field work and the other at Jalgaon a month later. In the review meetings all the teams were called at one place, reviewed the progress of work, errors found in the questionnaires were pointed out, field problems heard and appropriate guidance given for improving the quality of the data. Further, in the second review meeting the problems encountered in data entry due to inconsistencies in the data were also discussed and appropriate instructions given.

As such maximum efforts were made to ensure the quality of data and proper coverage. The survey work was completed by the end of July 2011 and the data entry operation completed by the end of August. The analysis of the data and report writing was undertaken by the survey team at TISS in Mumbai and the final draft report was completed by the end of November 2011.

2.7: Coverage of Households

Table 2.3 (Chart 2.2) gives number and percent distribution of households listed, selected, interviewed and percent coverage by study group (drip/sprinkler irrigated households, flood irrigated households, rain-fed cultivated households and landless households). The table also gives the weighted number of households interviewed in each group. It is seen from the table that the survey listed nearly 25 thousand households from the 54 selected villages and of them nearly 9 percent were drip/sprinkler irrigated households, 21 percent were flood irrigated (other than drip/sprinkler irrigated) households, nearly 26 percent were rain-fed cultivated (other than irrigated) households and the remaining 45 percent households were non-cultivating or landless households. Of the selected households in each group, 942 drip/sprinkler irrigated households, 1089 flood irrigated households, 988 rain-fed cultivated households and 1166 landless/non-cultivating households were interviewed. It is to be noted that at the time of interview, some of the households selected as drip/sprinkler irrigated households were found to be

flood irrigated households and some of the flood irrigated households turned out to be rain-fed cultivated households, and vice versa. It was because the households mistook or misreported their status or it was found at survey that they were not using their drip/sprinkler or the irrigation facilities for various reasons.



After applying appropriate weight for the disproportionate sample drawn from different strata, districts, talks, villages and within villages study groups, it is worked out that in the study population 10 percent of the households are drip/sprinkler irrigated households, 23 percent each are flood irrigated and rain-fed cultivated households and 45 percent are landless (including a few non-cultivating) households. However the estimate is only approximate due to the said (above mentioned) deficiencies in the sampling frames and some mismatch of group status between enumeration (listing) and survey.

2.8: Respondents and Duration of interview

The survey teams and field investigators were instructed to have interviews with the head of the household and spouse together as far as possible. In case if it was not possible to have both together for the interview it was instructed to have at least one of them and also one more person of opposite sex. It was also instructed to have even three respondents if possible. The reason being that information related to landholding and cultivation are dealt with, or known more to, male head and male members in household whereas births, health, food and related aspects are dealt with, or known more to, female head and female members in household.

Table 2.5 gives percent of household-interviews by number of respondents, sex-age of respondents, and relationship of respondents, classified by type of family and cultivated holding of household. It is seen from the table that in about 53 percent of the household-interviews there were at least two respondents and in case of 12 percent of the interviews there were 3 respondents. On the other hand, just 35 percent of the interviews were conducted with only one respondent. Further only in 8 percent of the interviews no male respondent was present. Similarly in 5 percent of the interviews all the respondents were below age 30 and in all other interviews at least one respondent with aged 30 or above was present. With respect to the relationship of the respondents, in only 44 percent of the interviews both the head and spouse were present and in most other interviews either the head or the spouse was present with or without other members. Single respondent interviews (mostly with a woman) were substantially higher among uni-member (100 percent) and couple-less (65 percent) households as compared to their counterparts. Otherwise there were very little variation in the choice of respondents with respect of cultivated holding and type of family. But at the same time it is seen that the respondent being very young (below age 30) was very rare even among landless and Couple less households. The combination of the respondents indicates that the information on different sections of the questionnaire can be said to have been captured appropriately and adequately.

It is seen from table 2.6 that on average a household interview took less than an hour (54 minutes) but there were large variations in the duration of interview, ranging from 30 minutes to 90 minutes. The mean duration of interview was 45 minutes if the number of members in the family was 3 or less and it increased to 70 minutes if the number of members was 8 or more. Further the average duration of interview was less than 40 minutes if the household was landless and it increased to 2 hours or even more if the cultivated holding was more than 25 acres. It is to be noted that the timing of interview and duration of interview recorded were never reviewed and not even checked by the survey coordinators or by the program officers, with a view to not giving the investigators an impression to adjust the timings. As such the recorded timings are expected to be reasonable. This indicates that the duration of interview was reasonable to the extent of not inducing any substantial strain, fatigue or discomfort to the respondent or to the interviewer to influence the quality of response or the interview.

Table 2.1a: District-wise area covered under drip and sprinkler irrigation by region (from 1986-87 to February 2011, area in hectares)							
Sr. No.	**District**	**Cultivable Area**	**1986-87 to February 2011**				**Stratum number**
			Drip	**Sprinkler**	**Total**	**%Drip/ sprinkler**	
NA	**MAHARASHTRA**	**20259000**	**627185**	**307767**	**934953**	**4.61**	NA
A	**Konkan Division**	**1238100**	**12632**	**219**	**12851**	**1.04**	NA
2	Raigad	256600	1662	38	1701	0.66	5
3	Ratnagiri	375900	3415	54	3469	0.92	5
4	Sindhudurg	220600	1905	24	1929	0.87	5
B	**Nashik Division**	**2575700**	**201266**	**26384**	**227649**	**8.84**	NA
5	Nashik	957300	76738	8993	85731	8.96	2
6	Dhule	447300	14777	2951	17728	3.96	4
7	Nandurbar	313200	6966	1544	8510	2.72	4
8	Jalgaon	857900	102784	12896	115680	13.48	1
C	**Pune Division**	**3711800**	**135888**	**30593**	**166481**	**4.49**	NA
9	Ahmed nagar	1314300	37213	18885	56097	4.27	4
10	Pune	1096500	31900	4062	35962	3.28	4
11	Solapur	1301000	66775	7646	74422	5.72	3
D	**Kolhapur Division**	**1832300**	**51574**	**24905**	**76479**	**4.17**	NA
12	Satara	676000	13377	11628	25004	3.70	4
13	Sangli	674200	31569	11664	43233	6.41	3
14	Kolhapur	482100	6628	1614	8242	1.71	5
E	**Aurangabad Division**	**2353300**	**60023**	**20139**	**80162**	**3.41**	NA
15	Aurangabad	765200	30725	7911	38637	5.05	3
16	Jalna	664400	20219	7296	27515	4.14	2
17	Beed	923700	9078	4932	14010	1.52	5
F	**Latur Division**	**3050500**	**66120**	**48071**	**114191**	**3.74**	NA
18	Latur	643800	16170	14982	31152	4.84	2
19	Osmanabad	663400	15209	4726	19935	3.01	4
20	Nanded	804300	17173	17418	34591	4.30	4
21	Hingoli	524100	4354	5365	9719	1.85	5
22	Parbhani	414900	13213	5580	18793	4.53	4
G	**Amravati Division**	**3301700**	**83344**	**124654**	**207999**	**6.30**	NA
23	Buldhana	727400	22421	41439	63860	8.78	2
24	Akola	469200	9433	14785	24218	5.16	3
25	Washim	418400	3956	14050	18006	4.30	4
26	Amravati	799400	35774	28000	63775	7.98	3
27	Yeotmal	887300	11760	26380	38140	4.30	4
H	**Nagpur Division**	**2195600**	**16338**	**32803**	**49141**	**2.24**	NA
28	Wardha	422400	5775	19489	25264	5.98	3
29	Nagpur	599700	8548	7604	16152	2.69	4
30	Bhandara	238900	928	1130	2058	0.86	5
31	Gondia	186000	285	971	1256	0.68	5
32	Chandrapur	544900	703	3068	3771	0.69	5
33	Gadchiroli	203700	99	542	641	0.31	5
Source: Horticulture department, Directorate/Commissioner of Agriculture, Pune							

Table 2.2: Stratum-wise number and percent distribution of total cultivable area and drip/sprinkler area.

Stratum (% drip area)	No. of districts	Cultivable area (ha)	Drip/sprinkler area (ha)	Cultivable area (%)	Drip/Sprinkler area (%)	% drip/Sp area to cultivable area
1 (>10)	1	857900	115680	4.2	12.4	13.5
2 (8-10)	3	2484100	213366	12.3	22.8	8.6
3 (5-8)	5	3632000	205774	17.9	22.0	5.7
4 (2-5)	13	8943500	347585	44.1	37.2	3.9
5 (<2)	11	4341500	52548	21.4	5.6	1.2
Total	33	20259000	934953	100.0	100.0	4.6

Table 2.3: Stratum-wise the list of districts, talukas and villages, with the number of house-holds as per 2001 census of the villages in parentheses

Stratum	District	Taluka	Villages
1	Jalgaon	Erandol	Adgaon (1487), Vankothe (390), Toli Kh.(172)
		Parola	Hirapur(209), Velhane Kh.(330), Karadi(152)
2	Nashik	Dindori	Navedhagur (151), Dindori (3002), Titave(291)
		Nashik	Girnare (866), Samangaon (827), Wasali(184)
2	Buldhana	Jalgaon(Jamod)	Pimpalgaon Kale (2016), Dhanora (718), Sawargaon (383)
		Khamgaon	Gondhanapur (574), Rahud (304), Gawandhala (359)
3	Akola	Akot	Akoli Jahangir (1167), Amboda (529), Wadali Satwai (329)
		Telhara	Danapur (1518), Wadi Adampur (470), Babulgaon (139)
3	Solapur	Karmala	Umrad (711), Warkute (471), Ramwadi (179)
		Sangola	Ajnale (653), Khavaspur (578), Bagalwadi (187)
3	Wardha	Deoli	Bhidi (793), Shirpur (Hore) (448), Ghodegaon (149)
		Seloo	Seloo (2037), Ghorad (1207), Deulgaon (268)
4	Osmanabad	Kalamb	Mangrul (825), Wagholi (302), Ranjani (716)
		Vashi	Vashi (2679), Kadaknathwadi (454), Ratnapur (354)
4	Satara	Javli Medha	Mhate bk/kh (339), Kolewadi(149), Bibhvi (237)
		Phaltan	Padegaon (383), Pawarwadi (612), Taradgaon (1385)
4	Ahmednagar	Nevasa	Kukana (1343), Nimbhar (386), Belpimpalgaon (1030)
		Shevgaon	Shevgaon (6056), Ghotan (653), Sultanpur Bk.(351)

Table 2.4: Households listed, selected, interviewed and weighted sample by study group.

Study groups	Number distribution				Percent distribution				
	Unweighted			Weighted	Unweighted			Weighted	
	Listed	Selected	Inter-viewed	Inter-viewed	Listed	Selected	Inter-viewed	Inter-viewed	Cover-age
Drip/sprinkler	2112	1142	932	418	8.7	23.4	22.3	10.0	81.6
Flood irrigation	5096	1301	1089	930	20.9	26.7	26.1	22.3	83.7
Rain-fed cultivation	6279	1168	988	966	25.8	24.0	23.7	23.1	84.6
Not cultivating/landless	10869	1261	1166	1861	44.6	25.9	27.9	44.6	92.5
Total	24356	4872	4175	4175	100.0	100.0	100.0	100.0	85.7

Note: For some selected cases the group status (as assessed during listing) changed during survey and this table is based on the status updated during survey. However updating could not be made for non-selected cases. It is one of the main reasons why the coverage is less especially for landholding households. The 'weighted' cases are the interviewed sample distribution of cases adjusted for the study design and coverage.

Table 2.5: Percent distribution of household-interviews by number of respondents, sex-age-relationship of respondents, classified by type of family and cultivated holding of household.

Type of family/ cultivated holding (acres)	Total House-holds	Number of respond-ents			Sex/age of respondents		Relationship of respondents				
		One	Two	Three	No males	None aged 30+	Head+ spouse +Other	Head+ Spouse	Head+ Other	Head only	Spouse +Other
Total	4175	35.5	52.8	11.7	8.2	5.1	7.3	36.7	11.6	30.9	13.6
Type of family											
Uni-member	99	100.0	0.0	0.0	88.9	2.0	0.0	0.0	0.0	100.0	0.0
Coupleless	143	65.0	30.1	4.9	57.3	14.0	0.0	2.1	26.6	57.3	14.0
Strictly nuclear	1943	34.7	58.4	6.8	4.1	4.6	6.2	52.1	4.3	30.9	6.4
Extended nuclear	680	33.8	55.1	11.0	8.2	7.4	6.9	33.2	16.9	28.2	14.7
Joint family(vertical)	924	29.8	51.8	18.4	2.9	3.7	10.7	25.1	18.6	24.5	21.1
Joint family(horizontal)	44	18.2	65.9	15.9	4.5	9.1	2.3	13.6	40.9	11.4	31.8
Joint family (vert/horiz)	342	29.5	42.4	28.1	2.3	3.5	10.2	14.9	17.5	24.3	33.0
Cultivated holding of household (acres)											
Nil	1166	39.5	53.4	7.1	17.9	8.1	4.8	40.5	8.7	32.2	13.7
Marginal (<=2.5)	1088	34.7	54.0	11.3	7.2	5.1	7.6	40.2	9.4	30.4	12.4
Small (2.6-5.0)	1062	36.9	50.3	12.8	4.0	3.7	7.9	33.2	12.2	34.1	12.5
Semi-Medium (5.1-10)	563	31.6	52.8	15.6	2.1	3.2	9.4	32.3	16.5	26.8	14.9
Medium/Large (10.1+)	296	24.7	55.7	19.6	0.7	1.4	9.1	29.4	19.9	23.0	18.6

Table 2.6: Duration of interview by household size and cultivated holding of household.

Characteristics	House-holds	Duration of interview (minutes)						
		20-30	31-45	46-60	61-90	91+	Total	Mean
Total	4175	17.3	31.5	26.5	18.7	6.1	100.0	54.2
Household size								
1-3	863	31.4	34.1	21.9	11.0	1.6	100.0	45.1
4-5	1925	16.2	34.3	26.7	17.6	5.2	100.0	53.1
6-7	901	11.4	29.4	29.4	22.6	7.1	100.0	57.6
8+	486	7.6	19.3	28.4	29.2	15.4	100.0	68.1
Cultivated holding of Household (acres)								
Nil	1166	44.3	42.9	11.4	1.2	0.3	100.0	37.0
Marginal (<=2.5)	1088	10.6	34.9	32.7	18.6	3.2	100.0	53.7
Small (2.6-5.0)	1062	6.2	28.3	34.5	26.4	4.6	100.0	58.5
Semi-Medium (5.1-10)	563	3.9	17.2	32.1	32.9	13.9	100.0	68.1
Medium (10.1-25.0)	265	1.1	13.6	24.5	33.6	27.2	100.0	78.3
Large (25.1+)	31	0.0	0.0	16.1	29.0	54.8	100.0	107.3

CHAPTER 3

Household and Population Characteristics

In this chapter we have discussed select background characteristics of the households such as religion, caste class, type of house, electrification of house, toilet facility, sources of water for household use, sources of fuel for cooking, household assets, type of family and population characteristics such as sex-age-marital status distribution of population.

3.1: Religion and Caste Class

In the household questionnaire information on religion and caste of (head of) the household and also the caste class under which the household comes, were asked and recorded. Though the respondents could report their religion and caste, some could not report or reported differently their caste class. Because of this, at the time of analysis of the data a cross-tabulation of the reported caste class by caste was made and the caste class reported by most of the households was assumed as the caste class for all the households of that caste irrespective of the reported caste class. In this report we have made the caste classes as scheduled castes (SC), scheduled tribes (ST), nomadic tribes (NT), de-notified tribes (DNT), other backward class (OBC) and special backward class (SBC), and general/other category (GC). Table 3.1 gives percent distribution of households by caste class classified by religion of head of the household. It is seen from the table that, as expected, the study population was predominantly Hindus constituting 90 percent of all households, followed by Buddhist (6 percent) and Muslim (3.5 percent). There are also a few (0.4 percent) Sikh, Jain and Christian households in the study population.

With respect to caste class 13 percent of the households were classified as belonging to scheduled castes (SCs) and nearly 7 percent as belonging to scheduled tribes (STs). In addition, nearly 10 percent of the households were also belonging to Nomadic tribes (NTs) and denotified tribes (DTs). However, a large proportion of 37 percent of households were classified as OBC/SBC and 33 percent as belonging to the general category. It is to be noted that the general category consisted of 87 percent of Hindus, 11 percent of Muslims and nearly 2 percent of Christians, Jains and Sikhs.

All the Buddhist households in the study population were scheduled castes. In Maharashtra the Buddhists were mostly Hindus and converted to Buddhism recently after Dr. Babasahib

Ambedkar embraced Buddhism. Among Hindus, SC/STs (including NT/DTs), OBC/SBC and the General category were almost equally divided with each group accounting for around one-third of all households. Among Muslims and Others, most of them were in the general category except 11 percent of Muslims classified as OBC/SBC and an equal proportion of 'Others' classified as scheduled tribes.

3.2: Housing

In this section we have discussed type of house and electrification of house, sources of water for household use and sources of fuel for cooking, are discussed.

3.2.1: Type of house and Electrification of House

In this study, type of house is considered in five categories namely reinforced cement concrete (RCC), pucca, semi-pucca, kuchcha and hut. An RCC house is one in which the roof of main portion of the house is made of reinforced cement concrete, wall made of burnt bricks with cement plastering and floor made of standard tiles, marble, mosaic, etc. A pucca house is one in which the roof is made of standard tiles/stone, wall made of burnt bricks with cement plastering and floor made of mosaic/tiles/marble and the like. In short a pucca house is one that is constructed with standard housing materials and with standard level of construction for the rural standard and if the house had RCC roofing then it is put under RCC. A semi-pucca house is one that is partly pucca and partly kuchcha in terms of materials and construction. A hut is one with usually only one room, both roof and walls thatched and no standard flooring. A kuchcha house is neither thatched nor constructed with pucca materials. It is to be noted that the type of house is assessed by the investigators through observation and not by enquiry with the respondents. However the investigators may seek clarification from the respondents about the materials used and the nature of construction if only required for assessing the type of house.

Table 3.2 gives percent distribution of households by type of house and electrification of house classified by caste class. It is seen from the table that only 11 percent of the households were living in RCC houses and another 14 percent were living in pucca houses. On the other hand a large proportion of 45 percent of the households were living in semi-pucca houses and another 27 percent were living in kuchcha houses. However, the proportion of households living in huts was below 4 percent. The proportion of OBC/SBC and general caste category households living in RCC and pucca houses was a little higher at around 30 percent as compared to SC/ST (including NT/DT) households at 16 percent. However the proportion of households living in hut was below 5 percent in all caste classes. Further as many as 90 percent of the households were elec-

trified and it was only slightly lower at 85 percent among households of scheduled castes and scheduled tribes (SC/STs).

3.2.2: Toilet Facility

It is seen from the same table 3.2 that as many as 52 percent of the households in the study population did not have toilet facility and it was as high as 62 percent among scheduled castes and scheduled tribes and 40 percent among the general category. On the other hand 43 percent of the households had flush toilet facility and the remaining 5 percent had some type of pit toilet facility. However for most of the households with toilet facility, it was their own, and community toilet facility was used by just 2 percent of the households. Among the SC/ST households only 32 percent of the households had own flush toilet facility whereas it was 42 percent among households of OBC/SBC and 51 percent among households of general category.

3.2.3: Sources of water

The respondents were asked to mention the sources from which they fetch water for household use (drinking and other purposes) and after listing all the sources mentioned, the respondents were asked to rank the sources in order of priority (of their own). It is to be noted that 'source' of water was defined as the type of 'water point' at which the household collected water. For example if an open well is connected to a over-head tank through pump set and then the water is supplied to households through a pipe line and a tap, then the source of water is 'tap' and not 'open well'. However, if people go to the well and draw water from it directly then 'open well' is the source of water. As such a source of water may be tap, bore well, open well, pond, river/stream, tanker, and so on. A household may draw water from different sources due to inadequacy and/or non-portability of water drawn from one source. So in this survey we asked to mention all the sources generally the household used to draw water and then asked to rank the sources according to their own priority or importance of the water sources. In this report all the sources mentioned by a household are termed as 'usual' sources and the rank 1 source is termed as the 'main' or 'major' source.

Table 3.3 gives percent distribution of households by main source of water and usual sources of water for household use. It is seen from the table that tap was predominantly the main source of water for household use for 80 percent of the households while open well and bore well were also used each by around 10 percent of the households. While for 80 percent of the households tap was the main source of water, for 90 percent of the households it was one of the sources of water. Further bore well was used by 30 percent of households and open well was used by 47 percent of the households. As many as 51 percent of the households had tap connection within their premises (own/shared), another 8.5 percent used neighbour's tap and a substantial proportion of 31 percent of the households used public/common tap. As far as bore

well and open well are concerned it was largely public/common wells that the people used most often. The main source and usual sources of water are further analyzed by caste class. It is seen from the table that the proportion of households drawing water from tap either as main source or as a usual source did not differ much between different caste classes though it was slightly less among SC/STs as compared to other caste classes.

3.2.4: Sources of Fuel

Table 3.3 also displays percent of households using fuel from different sources as 'main' source and as 'usual' sources for household purposes classified by caste class. It is to be noted that the questions asked for the sources of fuel are almost the same as that for the sources of water and are not repeated here. It is very clear from the table that wood (including straw, grass and crop residue) was the predominant main source of fuel for as many as 76 percent of the households and one of the usual sources of fuel for 92 percent of the households. However liquefied petroleum gas (LPG) was reported as the main source by nearly 22 percent of the households and as one of the usual sources by around 32 percent of the households. In addition to wood and LPG, as many as 48 percent of the households also used kerosene and 26 percent used cow dung as fuel in their houses. The main source and usual sources of fuel differ by caste class only with respect to LPG in that only 21 percent of the households belonging to SC/STs used LPG whereas it was 34-39 percent in the other caste classes.

3.3: Household Assets

The questionnaire listed a set of modern items commonly used by households and the respondents were asked to state if they possessed them. Table 3.4 gives percent of households having different household assets, classified by caste class. Overall 74 percent of the households had mobile/landline telephone, 73 percent had electric fan, 63 percent possessed television set (TV), 45 percent had cable/DTH connection, 48 percent possessed pressure cooker, 33 percent possessed mixer/grinder, 26 percent had scooter/bike/moped and 18 percent had electric iron. Items like VCD/DVD player, bullock cart, refrigerator and sewing machine were possessed by each 10-15 percent of the households. And, items like air cooler, radio or transistor and car/family vehicle were possessed by each about 2-7 percent of the households. Each of these items was possessed by a relatively lesser proportion of SC/ST households than OBC/SBC and general category households. At the same time, a significant proportion of 10 percent of the households did not posses any of these items, and it was slightly higher among SC/ST households (15 percent) as compared to OBC/SBC and general category households (8 percent).

The fact that a large proportion of households including SC/STs having LPG connection and many modern goods in their households, indicates that modernization is very active and progressive in the rural areas of Maharashtra. But it could not be said immediately that it is due to or largely due to the penetration of drip/sprinkler irrigation in Maharashtra and the associated higher agricultural income. But the indications are that it is at least partly true.

3.4: Possession of PDS/Ration card

The respondents were asked as to what type (category) of PDS/ration card they (household) possessed. In case the respondent could not tell what category of the card, the respondents were asked to show the card and if they could not do so then they were probed to tell the colour of the card and the rate at which they got rice and wheat, and based on these and also on the socioeconomic condition, the category of the card was assessed. Table 3.5 gives percent distribution of households by type of PDS card they possessed, classified by caste class. It is seen from the table that 45 percent of the households possessed APL card, 35 percent possessed BPL card and only a small proportion of 7 percent of the households possessed Antyodaya (BBPL) card. At the same time as many as 13 percent households reported that they did not possess any PDS/ration card. It was found that many of the families who did not possess PDS card were those who recently formed a new family or they had applied but not yet received the card.

While the proportion of households possessing APL card increased from 32 percent among SC/STs to 46 percent among OBC/SBCs and to 57 percent among general category, the proportion of households possessing BPL card decreased from 43 percent among SC/STs to 33 percent among OBC/SBCs and to 30 percent among general category. The proportion of households possessing Antyodaya (BBPL) card also showed a similar pattern, 12 percent, 7 percent and 3 percent, respectively.

3.5: Cultivated holding of Households

Depending on the amount of cultivated holding, the households were categorized into landless/ non-cultivating households, marginal farmers (with up to 2.5 acres of cultivated holding), small farmers (with 2.6 to 5 acres), semi-medium farmers (with 5.1 to 10 acres) and medium/large farmers (with more than 10 acres) and the data cross classified by caste class is given in table 3.5. It is seen from the table that nearly 40 percent of the households in the study population was landless and another 5 percent of the households possessed some land but not cultivating

it. In total 45 percent of the households were not farmers and only 55 percent were farmer households. The non-formers were as high as 61 percent among SC/STs but only 43 percent among OBC/SBC and just 30 percent among the general category. On the other hand among all households less than 13 percent were considered as semi-medium, medium and large farmers and all others (43 percent of all households) were marginal/small farmers with up to 5 acres of land. Further the proportion of households with more than 5 acres of cultivated holding accounted for just 7 percent among SC/STs whereas it was 14 percent among OBC/SBC and 17 percent among general category.

3.5: Household Size and Family Type

Table 3.6 gives percent distribution of households by household size and type of family classified by caste class. It is seen from the table that overall around 11 percent households had each more than 8 members, another 21 percent had each 6-7 members and 45 percent had each 4-5 members. On the other hand nearly 20 percent of the households had each 2-3 members in their families and nearly 3 percent of the households were single member (uni-member) households. The family size pattern of households did not vary very much by caste class of the households.

Based on the relationship of household members, the households were categorized as uni-member households (single member households), couple-less households (two or more members without husband-wife relationship), strictly nuclear households (husband, wife and their own unmarried children only), extended nuclear households (strictly nuclear family members plus at least one additional member without husband-wife relationship) and joint family households (two or more couples of any age with or without additional members).

Table 3.6 also presents percent distribution of households by type of family classified by caste class. It is seen from the table that more than 3 percent of the households were uni-member households. Uni-member households were relatively more among OBC/SBCs households than among their counterparts. Another nearly 4 percent of the households were couple-less households. Couple-less households were essentially households consisting of a widow, widower, or divorced/separated woman and her/his dependents. Coupleless households were relatively slightly more among SC/ST and OBC/SBC households than among general category households.

In the study population a large proportion of 48 percent of the households were strictly nuclear families and another 15 percent were extended nuclear families. Put together uni-member, couple-less, strictly nuclear and extended nuclear families, as many as 70 percent of the households were in the broader sense ‘nuclear’ families. On the other hand joint families were only

30 percent. The data shows that the study population was essentially nuclear family households. The extent of strictly nuclear families, extended nuclear families and joint families did not differ much by caste class.

3.7: Sex-Age-Marital status

3.7.1: Sex-Age distribution

Table 3.7 gives percent distribution of household members by sex and age. The data show that 26 percent of the population was in the age group 0-14 and nearly 12 percent of the population was in the age group 60+. The table 3.7 also presents sex ratio, percent of persons in 0-4 age group and percent of persons aged 60+ by sex, classified by caste class. The table reveals that the sex ratio of 0-4 and 5-14 years age group was much higher (1031-1056) among SC/STs than among OBC/SBCs (737-796) and general category (744-935) households. Apart from this pattern, there appears to be no further differentials in the age distribution of population by caste class.

3.7.2: Marital Status Distribution

Table 3.8 gives percent distribution of household members by marital status, classified by age and sex. The marital status distribution of male and female population shows that only about 14 percent of females and almost no males in the age group 15-19 were married. However in the age group 20-24 more than 75 percent of females and more than 17 percent of males were married. The proportion of persons who remained unmarried even after age 40 was just 1 percent among both males and females. However among females nearly 3 percent in the age group 25-29, 4.5 percent in the age group 30-34 and nearly 8.5 percent in the age group 35-39 were widowed, separated or deserted. This proportion fast increased as age increased further and it was 32 percent in the age group 60-69, more than 66 percent in the age group 70-79 and 87 percent in the age group 80 and higher. Among males, until age 59 only around 1-2 percent were widowed and the figure reached only 5 percent in the age group 60-69, 11 percent in the age group 70-79 and 29 percent in the age group 80 and higher. Among both males and females the proportion widowed increased as age increased but proportion widowed was much higher among females than among males in any age group.

Table 3.1: Percent distribution of households by caste class, classified by religion of head of household (weighted)

Caste Class	Religion				Combined		
	Hindu	Buddhist	Muslim	Others	**All Per-cent**	Weighted cases	Unweighted cases
Scheduled castes	11.2	100.0	0.0	0.0	**13.0**	649	542
Scheduled tribes	8.4	0.0	3.6	11.1	**7.1**	322	297
Nomadic/denotified tribes	10.7	0.0	1.9	0.0	**9.5**	402	397
OBC/SBC	35.6	0.0	10.9	0.0	**37.1**	1347	1547
General (other)	34.1	0.0	83.6	88.9	**33.3**	1455	1392
Total (%)	100.0	100.0	100.0	100.0	**100.0**	-	-
Weighted cases	3725	230	194	26	**4175**	4175	-
All row %	**90.1**	**6.0**	**3.5**	**0.4**	**100.0**	-	-
Unweighted cases	3761	251	148	15	4175	-	4175

Note: OBC - Other Backward Class and SBC - Special Backward Class.

Table 3.2: Percent distribution of households by type of house, electrification of house, toilet facility, type of PDS/Ration card, classified by caste class.

HH Characteristics	All	SC/STs	OBC/SBC	General
Type of house				
RCC	11.2	5.6	15.4	12.8
Pucca	13.9	10.3	16.1	15.2
Semi Pucca	44.5	46.2	40.1	46.9
Kuchcha	26.9	32.9	26.2	21.8
Hut	3.5	5.0	2.2	3.3
House electrified	89.4	84.9	93.5	90.0
Toilet facility				
None	51.5	62.2	52.5	40.5
Flush (Self)	41.5	31.5	41.9	50.7
Flush (Community)	1.8	2.1	0.8	2.5
Pit (Self)	4.0	3.3	3.8	4.8
Pit (Community)	0.8	0.7	1.0	0.6
Other	0.4	0.2	0.0	0.8
Total (%)	100.0	100.0	100.0	100.0

Table 3.3: Percent of households using different water and fuel sources as main source and as usual sources, classified by caste class

Water & Fuel sources	Major Source	Usual sources*			
		All	SC/STs	OBC/SBC	General
Water Sources					
Own/shared tap	50.1	50.9	38.3	65.7	48.9
Neighbor's tap	5.6	8.5	7.5	12.2	6.1
Common tap	21.3	31.0	38.4	23.2	31.2
Own/Shared bore well	3.3	5.1	3.9	3.4	7.8
Neighbor's bore well	0.6	3.4	3.4	2.7	3.9
Common bore well	5.4	21.7	23.3	19.7	22.0
Own/shared open well	7.3	11.5	6.9	11.1	16.1
Neighbor's open well	2.2	17.5	18.9	13.9	19.4
Common open well	3.9	17.9	20.1	20.5	13.4
Surface	0.1	1.4	1.6	1.3	1.4
Tanker	0.0	0.5	0.0	0.5	0.9
Other (Mostly farm well)	0.1	1.4	1.2	2.5	0.7
Tap	79.6	90.3	84.3	100.0	86.2
Bore well	8.9	30.1	30.6	25.9	33.6
Open well	11.4	46.8	45.9	45.5	48.9
Surface	0.2	3.4	2.8	4.3	3.0
Fuel Sources					
Wood/Straw/Grass	76.3	92.0	94.9	92.2	89.0
LPG/Natural Gas	21.7	31.5	21.1	33.8	39.3
Kerosene	1.3	47.9	48.3	43.8	51.2
Biogas	0.4	0.5	0.0	0.3	1.1
Cow dung	0.1	25.7	28.5	26.6	22.2
Other (Coal/Solar/Elec.)	0.2	1.9	1.5	1.4	2.6

* Multiple responses applicable (each percent value is based on total weighted cases in the corresponding category)

Table 3.4: Percent of households possessing different household assets, classified by caste class

Assets	All	SC/STs	OBC/SBC	General
Mobile Telephone	74.1	67.6	74.6	79.8
Electric Fan	73.1	60.6	82.0	76.9
Television Set	62.5	55.6	65.4	66.4
Pressure Cooker	48.2	37.4	54.2	52.7
Cable/DTH Connection	44.8	37.1	46.7	50.4
Mixer/Grinder	32.9	20.7	38.7	38.9
Scooter/Bike /Mopped	26.0	14.3	26.8	36.1
Electric Iron	18.4	12.9	19.4	22.8
VCD/DVD Player	15.3	13.6	15.0	17.2
Bullock Cart	12.9	6.5	17.5	14.6
Refrigerator	12.2	5.9	12.2	18.2
Sewing Machine	10.2	8.8	11.7	10.3
Air Cooler	6.9	3.6	9.9	7.2
Radio or Transistor	5.8	5.5	4.7	7.0
Landline Telephone	4.8	3.5	4.9	5.8
Car/Family Vehicle	2.8	1.4	2.4	4.7
Tractor	2.8	0.7	2.1	5.5
None/No item	10.4	15.3	7.6	8.5

Note: Items like Computer, Tempo/truck, Washing machine, Thresher, Internet connection, Air conditioner and solar lantern are possessed by just 1-2 percent of households.

Table 3.5: Percent distribution of households by type of PDS/Ration card possessed, classified by caste class.

PDS/Ration Card	All	SC/STs	OBC/SBC	General
APL Card	45.1	32.0	46.2	56.5
BPL Card	35.2	43.1	33.2	29.5
Antyodaya Card	7.0	11.5	6.7	3.0
None	12.7	13.4	13.8	11.0
Total (%)	100.0	100.0	100.0	100.0

Table 3.5: Percent distribution of households by cultivated holding of household, classified by caste class				
Cultivated holding	All	SC/STs	OBC/SBC	General
Landless	39.0	55.9	36.2	25.5
Not cultivating *	5.6	5.0	6.9	5.0
Landless/Not cultivating	44.6	60.9	43.1	30.5
Marginal farmer (<=2.5)	23.2	19.6	23.1	26.7
Small farmer (2.6-5.0)	19.5	12.7	19.7	25.7
Semi-Medium (5.1-10.0)	8.9	5.2	10.2	11.1
Medium/large (10.1+)	3.9	1.6	3.9	6.0
* Households not cultivating but holding some land or all land leased out				

Table 3.6: Percent distribution of households by family size and type of family, classified by caste class.				
Particulars	All	SC/STs	OBC/SBC	General
Household size				
1	3.2	3.0	3.7	2.9
2-3	19.8	18.8	22.0	18.7
4-5	44.9	42.6	48.1	44.2
6-7	20.8	24.1	17.8	20.4
8+	11.3	11.6	8.4	13.8
Type of family*				
Uni-member	3.2	3.0	3.7	2.9
Coupleless	4.2	4.6	4.4	3.5
Strictly nuclear	47.8	48.9	48.7	46.0
Extended nuclear	15.3	14.8	16.0	15.2
Joint family(vertical)	20.9	20.9	20.5	21.2
Joint family(horizontal)	1.1	1.1	0.8	1.6
Joint family (vert & horiz.)	7.5	6.7	6.0	9.6
Type of family* - Unimember (single member households), Coupleless (two or more members without husband-wife relationship), strictly nuclear (husband, wife and their own unmarried children only), extended nuclear (strictly nuclear family members plus at least one additional member without husband-wife relationship) and joint family (two or more couples of any age with or without additional members)				

Table 3.7: Age group wise percent distribution of males and females in the households classified by caste class				
Age group	All	SC/STs	OBC/SBC	General
Males				
00-04	8.9	9.4	8.8	8.6
05-14	17.5	18.4	17.1	17.2
15-29	28.7	30.3	29.0	26.9
30-44	19.8	18.8	20.1	20.4
45-59	13.2	12.4	12.8	14.1
60+	11.9	10.6	12.2	12.8
Total (%)	100.0	100.0	100.0	100.0
Weighted cases	10724	3516	3385	3823
Females				
00-04	7.9	9.8	7.2	6.7
05-14	17.3	19.6	15.2	16.9
15-29	27.3	27.4	26.8	27.6
30-44	20.1	18.8	21.7	20.1
45-59	14.7	13.4	15.6	15.2
60+	12.6	10.9	13.5	13.5
Total (%)	100.0	100.0	100.0	100.0
Weighted cases	10136	3476	3023	3637
Combined				
00-04	8.5	9.6	8.0	7.7
05-14	17.4	19.0	16.2	17.0
15-29	28.0	28.9	28.0	27.2
30-44	19.9	18.8	20.8	20.2
45-59	13.9	12.9	14.2	14.6
60+	12.2	10.8	12.8	13.2
Total (%)	100.0	100.0	100.0	100.0
Weighted cases	20860	6993	6408	7460
Sex ratio (1000*F/M)				
00-04	840.9	1031.2	736.6	743.5
05-14	933.8	1055.9	795.8	934.9
15-29	898.5	893.0	824.3	975.0
30-44	961.3	988.0	963.2	937.1
45-59	1058.3	1067.6	1087.1	1027.5
60+	1000.6	1016.0	985.7	1001.5
All ages	945.1	988.6	893.1	951.2

Table 3.8: Percent distribution of household members by marital status, classified by age and sex.

Age group	Unmarried	Married	W/D/S	Total (%)	Unweighted cases
Male					
10-14	99.9	0.1	0.0	100.0	1003
15-19	99.9	0.0	0.1	100.0	961
20-24	82.2	17.4	0.5	100.0	1243
25-29	31.9	67.4	0.7	100.0	987
30-34	4.1	94.7	1.2	100.0	789
35-39	1.9	96.8	1.3	100.0	781
40-44	0.2	98.5	1.3	100.0	619
45-49	0.7	98.1	1.1	100.0	588
50-59	0.5	98.5	1.0	100.0	956
60-69	0.9	94.2	4.9	100.0	795
70-79	0.0	89.0	11.0	100.0	415
80+	0.0	70.8	29.2	100.0	144
15-44	43.5	55.7	0.8	100.0	5380
45-59	0.6	98.4	1.1	100.0	1544
60+	0.5	90.6	8.8	100.0	1354
Female					
10-14	99.5	0.5	0.0	100.0	953
15-19	86.0	13.7	0.3	100.0	924
20-24	24.0	74.9	1.1	100.0	932
25-29	6.0	91.3	2.8	100.0	912
30-34	0.8	94.7	4.5	100.0	757
35-39	1.5	90.0	8.5	100.0	752
40-44	1.1	88.0	10.9	100.0	573
45-49	0.6	86.5	12.8	100.0	670
50-59	0.9	82.7	16.4	100.0	886
60-69	0.2	68.3	31.5	100.0	644
70-79	0.0	33.6	66.4	100.0	370
80+	0.0	13.3	86.7	100.0	101
15-44	22.4	73.5	4.1	100.0	4850
45-59	0.8	84.3	14.9	100.0	1538
60+	0.1	54.9	45.0	100.0	1311

CHAPTER 4

Education and Work

In this chapter we discuss literacy and education of males and females, school attendance, expenses on education, benefits received from schools, work participation, occupational pattern, and duration and seasonal variations in occupation. Income from occupation is dealt with in a later chapter.

4.1: Literacy and Educational Levels

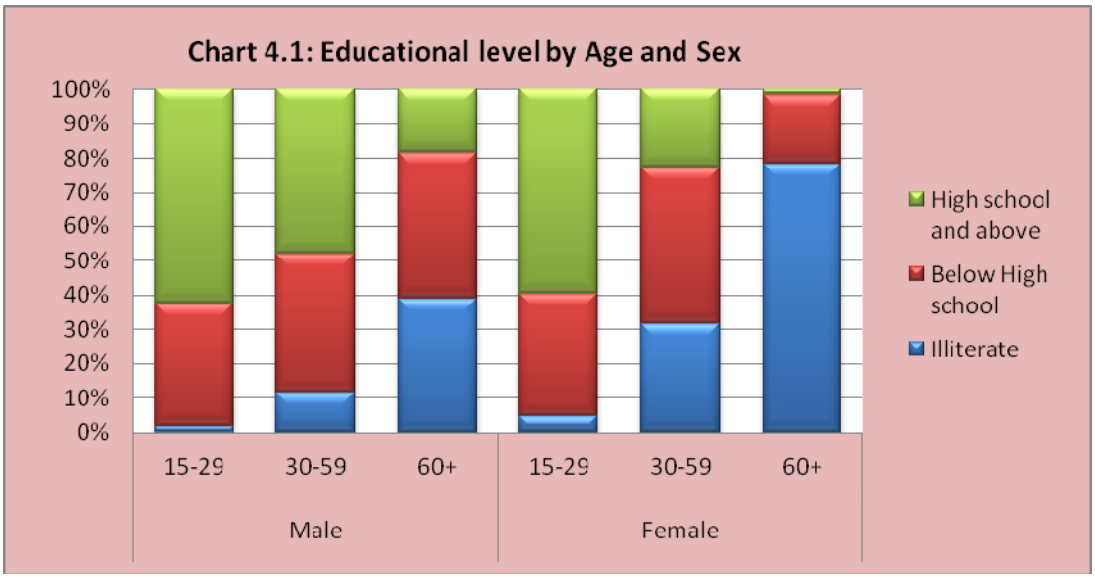
4.1.1: literacy levels

In this study, in respect of all household members age 7 and above, whether the person can read and write and if so what was the highest standard he/she completed was asked. Provision was made to record school and college education, professional courses such as engineering, management, and medical, pre- and post-SSLC courses such as ITI and Polytechnic. Table 4.1 and chart 4.1 give percent distribution of 7+ age group persons by literacy and educational level, classified by sex and age. It is seen from the table and also from the chart that very few males (less than 12 percent) and a substantial proportion of females (28 percent) were illiterate and all others were literates. However, age-wise, the proportion of males literate was more than 97 percent in the age group 7-24, above 88 percent in the age group 25-59 and only 60 percent in the age group 60 and above. The corresponding figures for females were above 95 percent for the age group 7-24, 68 percent for the age group 25-59 and just 21 percent for the age group 60 and above. The data show that illiteracy is substantial among women and that to among older women, but otherwise literacy is almost universal for the younger age groups among males and females.

4.1.2: Educational levels

With respect to educational level, it is observed that about 40 percent of the males aged 7 and above had completed high school education but just 12 percent had entered in to a graduate course. However for the age group 15-59 the figures were 53 percent and 16 percent respectively. Among females 24 percent in the 7+ age group completed high school and it was 34 percent for the age group 15-59. However the proportion of females entered into a graduate col-

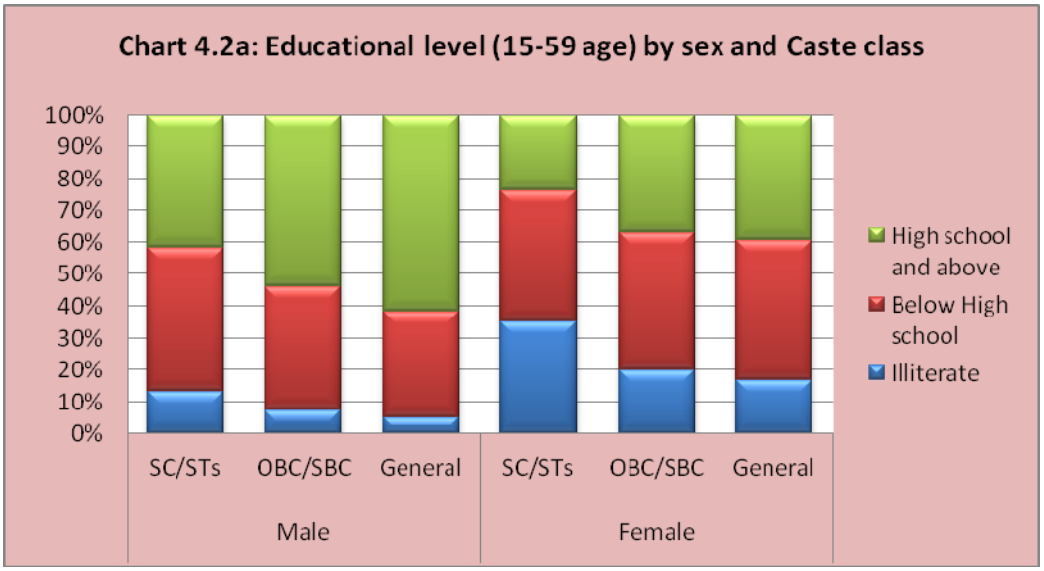
lege was just 5 percent. It shows that there is a difference in the educational level of males and females with males having an upper hand in higher (college) education. At the same time if we consider the young age group 15-24 as many as 63 percent of males and almost an equal proportion of 59 percent of females had completed high school and 20 percent of males and 14 percent of females had entered into a graduate course. It appears that though males are better educated than females, in the recent years the differences are narrowing. It is important to note that though a significant proportion of males and females who had college education in the recent years, the proportion going to professional courses like engineering and medical was still negligible, below 2 percent among males and below 1 percent among females.

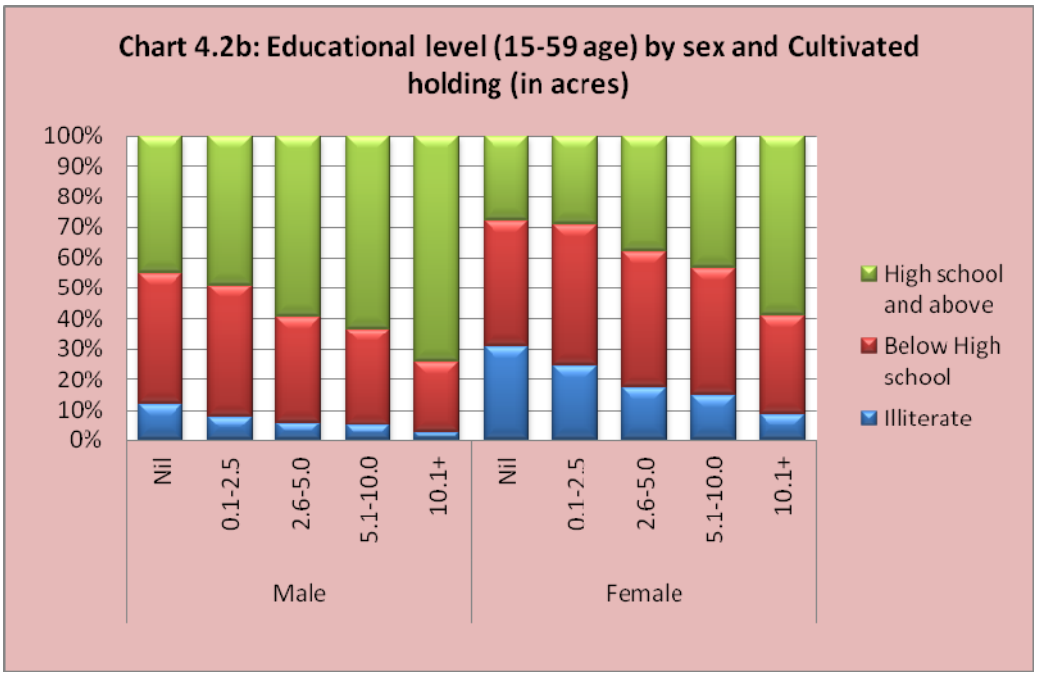


4.1.3: Literacy and Educational Differentials

Literacy and educational differentials is analyzed with respect to caste class and cultivated holding of household. The data are presented in table 4.2 also depicted in charts 4.2a and 4.2b. It is seen from the table and charts that literacy among males in the age group 15-59 was very high (above 85 percent) in all caste classes and in all cultivated holding groups including landless households. At the same time female literacy was substantially less among SC/STs and landless and marginal farmer households. Further, in these groups, the proportion of males and females who completed high school education was relatively less. The second panel of the table 4.2 shows that, for males in the age group 15-59, the proportion completed high school was 42 percent among SC/STs, 54 percent among OBC/SBCs and as high as 64 percent among the general caste category that includes all non-Hindus. The corresponding figures for females were 24 percent for SC/STs and 37-39 percent for the other caste groups. Similarly the proportion of males in the age group 15-59 who completed high school education was 45-49 percent among landless and marginal farmers, 59-63 percent among small and semi-medium farmers and 74

percent among medium and large farmers. The corresponding figures for females were 28-29 percent, 38-44 percent and 59 percent. So it is clear from the analysis that though literacy and education were substantial in all section of the society, higher education was relatively higher among forward caste groups and higher landholding households.



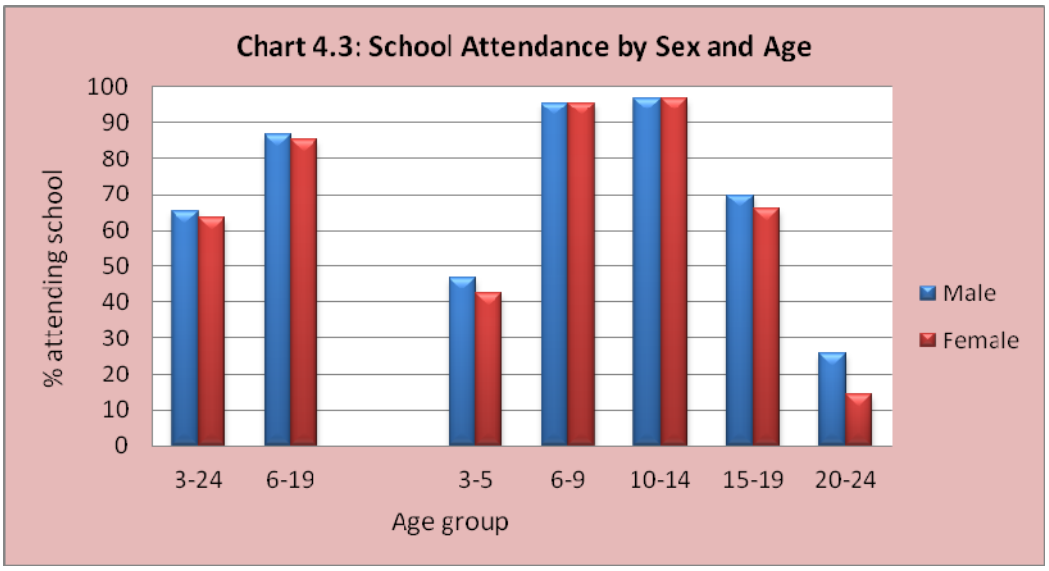


4.2: School/College Attendance and Dropout

Information on whether attending school/college, and if not, whether attended school/college last (academic) year was asked in respect of all males and females in the age group 3-24. Further, in respect of those who dropped out or had no schooling and remained in the age group 6-17 at survey, the reason(s) for that was also obtained.

4.2.1: School/college attendance

Table 4.3 and chart 4.3 give percent of 3-24 age group persons studying, percent dropped out and percent never attended school by age and sex. Overall, in the age group 3-24, around 65 percent of males and females were studying and the proportion studying increased to 86 percent if only the age group 6-19 was considered. The proportion of children 3-5 years attending pre-school (Anganwadi, LKG, UKG and the like) was 47 percent among males and 43 percent among females. However in the age group 6-14 more than 95 percent of males and females were attending school. In the age group 15-19 also 66-70 percent of the children were attending school. It appears that pre-primary education was substantial and primary to high school education was almost universal among both male and female children in the study population. The problem appears to be after high school because, after completing high school, dropout shoots up. It is clearly evident from the school/college attendance in the age group 20-24, at which age only 26 percent of males and just 14 percent of females were attending school/college.



4.2.2: School Dropout

Regarding drop out from school, the data are looked at in two ways, one, children attended school/college last year (2009-10) but not attending school this year (2010-11) and two, chil-

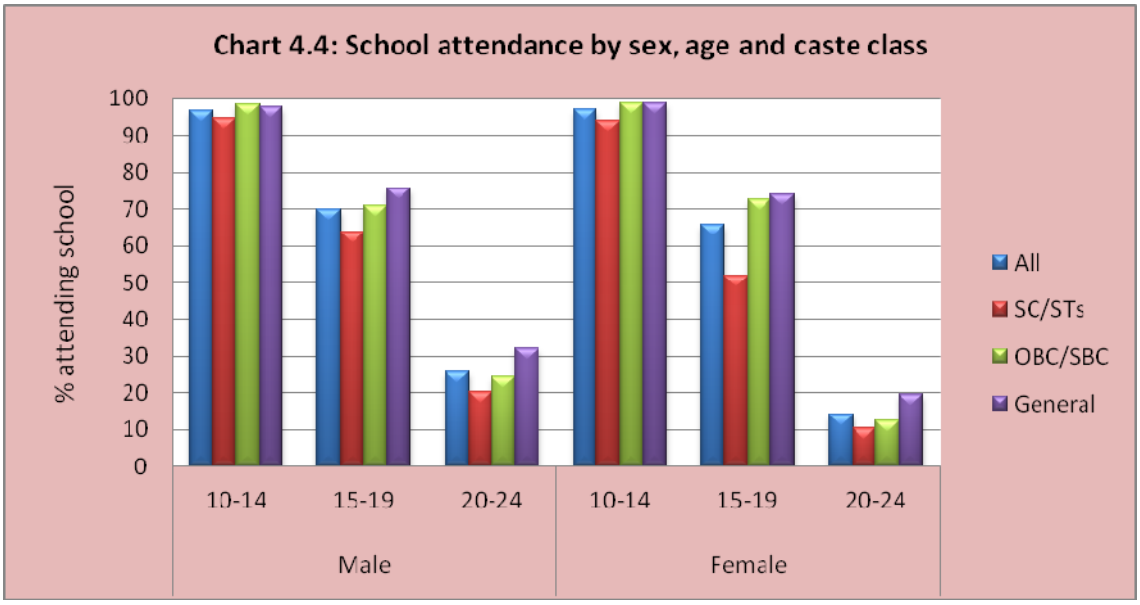
dren dropped out last year (2009-10) or earlier among those who ever attended school. While the first index reflects the annual rate of dropout, the second index represents the cumulative dropout. Accordingly the annual rate of dropout of children of age 14 or less is negligible, or below 1 percent. Further even in the age group 15-19 the dropout rate for the last one year was around 2 percent only though the total or cumulative dropout was as high as 27-29 percent. The total dropout rate for the age group 20-24 was 70-79 percent. It appears that dropout of children from attending school before completing middle school was negligible and before completing high school was only moderate in the recent years. Further children never attending school was also negligible among both males and females of younger ages.

4.2.3: Reasons for Dropout

Information on reason for school dropout was obtained for the age group 6-17 only and the data are presented in table 4.4. Though fewer numbers of children dropped out from school in the age group 6-17, it was predominantly children who were too poor in studies who dropped out (26 percent). The next predominant reason stated was economic factor, that children had to work to support the household and the dropout for this reason was more among males (30 percent) than among females (17 percent). The other reasons mentioned were that they were required to attend domestic chores, higher education not considered important, and the like. Also it is seen from the FGDs that many parents (male and female participants) were generally not in favour of sending their daughters to school/college after age 15 only if the school/college was far away, road to school not safe, a belief that higher education was not important for girls, etc. For male children, these kinds of issues were not raised in the FGDs. Hence, due to such kind of restrictions, school/college attendance among female children after age 15 was relatively less as compared to male children. However economic reasons were not brought forward by the FGD participants.

4.2.4: Differentials in School Attendance

With respect to differentials in school attendance, table 4.5 and chart 4.4 give percent of children of age 3-24 studying by age and sex, classified by caste class. It is seen from the table and chart that school attendance among both males and females in the age group 10-14 was the same in all caste classes including SC/STs. However, after age 14 (middle school), school attendance dropped more rapidly among children of SC/STs than among children of other caste classes.



4.2.5: School Related factors

Table 4.6 gives percent distribution of students (of age group 7-24 who attended school/college during the 2010-11 academic year) by distance to the institution, type of institution, medium of instruction and place of stay, by sex and standard attended. For more than three-fourths of the primary-school-attending children their school was within the village or within a kilometre and for another 15 percent of the children it was within 1-5 kms. It appears that only a few children are sent to primary school located a little away from the village, otherwise all children attend primary school within the village or within the vicinity of the village. Further more than 60 percent of the children attending middle school were having their school within the village and for most others the school was within 5 kilometres from the village. However, as the standard of study advanced the proportion of children studying away from the village or at a longer distance also increased. Specifically, for college studies, except 20 percent of the students, all travelled more than 5 kilometres and for around 40-50 percent of college students, they had to go more than 20 kms from the village.

Like the distance to institution, as the standard of study advanced, the type of institution changed from government to government-aided and then to private institution. It is interesting to note that only around 70 percent of the primary school children were studying in government institution and most others were studying in government-aided institution. However even for college education only around 20 percent of the children were studying in private institution but majority of them were studying in government-aided institution.

The medium of instruction was predominantly Marathi until higher secondary level and even among college student as many as 60-68 percent were studying in Marathi medium and most

others were studying in English medium. The place of stay for studies was parents' home for more than 90 percent of the students at primary, middle, high and higher secondary school levels and even for college studies as many as 64-73 percent were commuting from home. There is no substantial sex differential in the distance to the school, type of school and place of stay.

4.2.6: Expenses on Education

Table 4.7 gives percent distribution of students who attended school/college last academic year (2010-11) by amount of institutional and personal expenses on education in one year, by school/college attended and sex of student. Regarding expenses incurred for education in one year towards tuition fees, institutional charges, books and uniforms, etc, the respondents reported a median amount of Rs 610-640 for primary education, around Rs. 750-775 for middle school education, Rs. 1700-1800 for high/higher secondary education and as much as Rs. 4500-5000 for higher education. Expenses on stay, food, transport, etc was met by only 10-15 percent of male and female students at primary and middle school levels, 30-35 percent of students at high/higher secondary level, and more than 80 percent of students at higher levels. Among those who reported expenses, the median amount of expenses in one year varied from around Rs. 2000-2500 at primary to high school level and to Rs. 4000-5000 at college level education. The expenses incurred by male students were only marginally higher than the expenses incurred by female students.

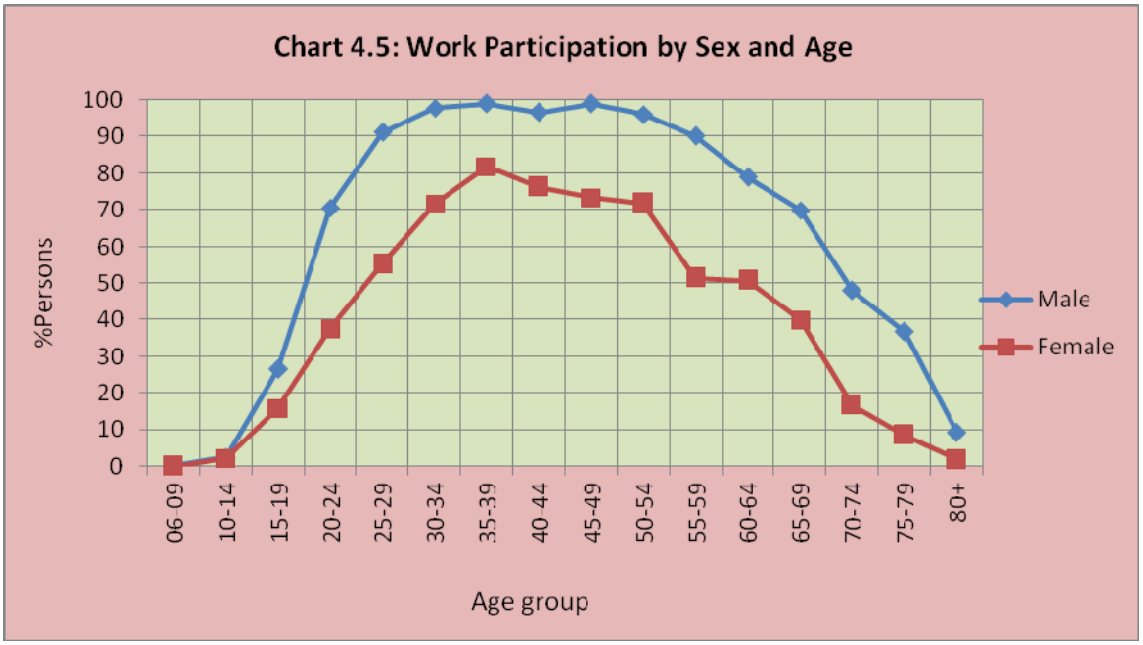
4.3: Nature of Economic Activities

With respect to economic activities of households and household members, first the respondents were asked of each person aged 6 or above in the household as to whether he/she was engaged in any income generating activity at any time during the past one year either in family farm/business or working for others, either full time or part time, and regular or seasonal. In respect of all those who were reportedly engaged in some economic activity, details of the activities were recorded. The field investigators were instructed to probe and record if a person was engaged in different activities at the same time or at different times (seasons) and provision was made in the questionnaire to record as many activities as applicable.

4.3.1: Work Participation Rate

Table 4.8 and chart 4.5 give percent of persons (6+ age group) engaged in any economic activity (work participation rate) by sex and age. Overall 54 percent of the population in the age group 6 and above was engaged in some kind of economic activity during the past one year before the survey and the proportion was higher (64 percent) among males and lower (44 percent) among females. Economic activity among persons age below 15 was negligible indicating the absence

of child labour. But after age 14 the proportion of persons engaged in economic activity fast increased and reached a maximum or a very high level by age 25. From chart 4.5 it is clear that the proportion engaged in economic activity among males was the highest in the age group 25-59 with a participation rate of 90-99 percent and among females it was the highest in the age group 30-54 with a participation rate of 70-80 percent. However among males the participation rate was at least 50 percent in each of the 5 year age groups from age 20 to 74 and among females the participation rate was at least 40 percent in each of the 5 year age groups from age 20 to 69. It is clear from the data that many males and females start working at around age 15 and by age 24 most persons were working and continued to work until age 70 or even beyond. In other words most males and majority of females work from age 20 to 70 for their livelihood.



4.3.2: Economic Activities

Many workers are not confined to a single type of activity but often they do different types of work at the same time or at different times or seasons. So an analysis is made with respect to the number of economic activities, the main (or first) activity, all activities together and a combination of activates performed during the last one year. Here the main (first) activity is the activity the respondent considered it as the first/primary activity of the person. It was not based on any criteria like spending maximum time or maximum income generated from that activity. Table 4.9 and chart 4.6 displays the type of economic activities reportedly performed by male and female members. It is clear from the chart that own-farming and agriculture labour, were the two predominant economic activities performed by the household members in the study population. Further a sizeable proportion of males were also engaged as non-agriculture sector

occupations. The proportion of persons engaged in salaried employment, trade/business and the like was very less among both males and females.

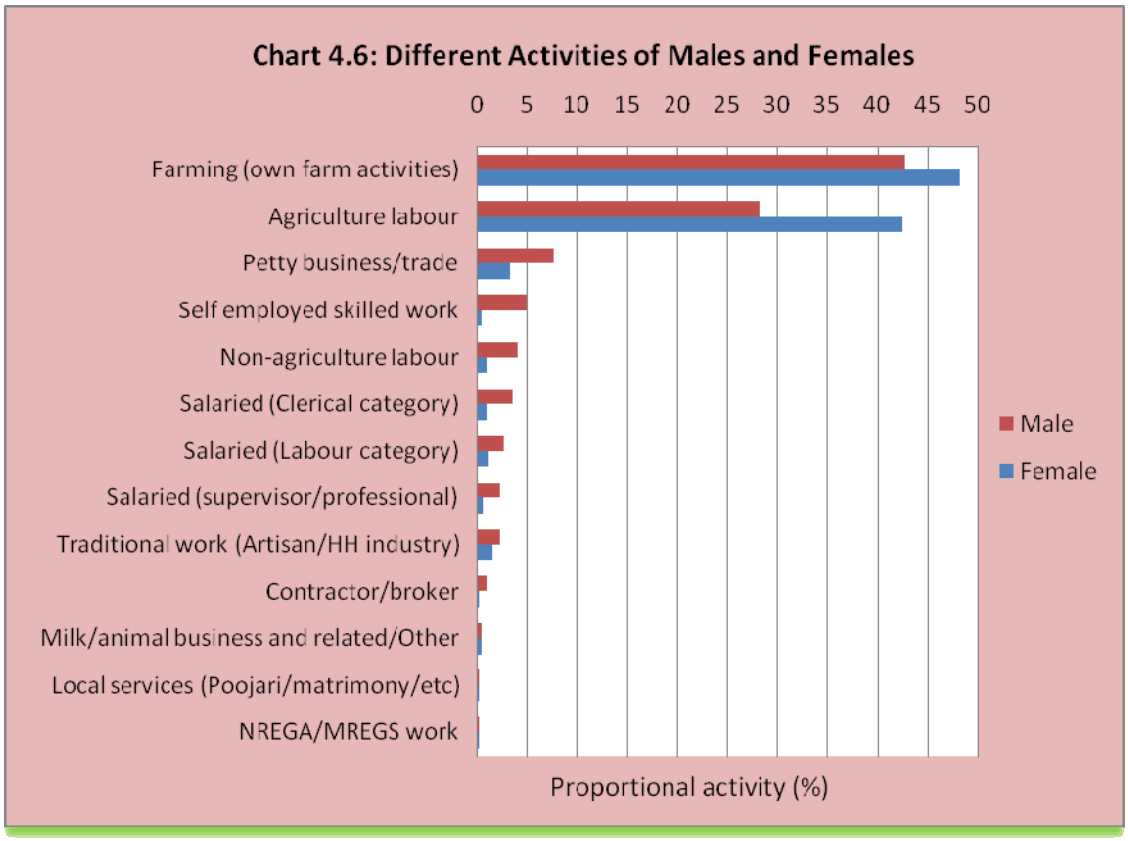


Table 4.10 gives percent of household members engaged in any economic activity, percent distribution of workers by number of economic activities, by first/main activity, by second activity and by combination of activities performed during the last one year, by sex and age. Around 80 percent of the workers were confined to only one type of activity and most others reported 2 activities. More than one activity was reported more by workers in the age group 25-49 than by workers in the younger and older age groups. The number of activities and age pattern of activities are almost the same among both males and females.

Nearly a half of the male and female workers were engaged in farming and it slightly increased among males as age increased but such a pattern was absent for females. Another one-fourth of the male workers and more than one-third of the female workers were engaged in labour work, mainly in agriculture sector. A small proportion of the workers were also engaged in other occupations such as self employment, business/services and salaried employment.

With respect to combination of economic activities, it is seen that, of all workers, the proportion engaged in own farm activities (cultivation) only was just 32 percent among males and 40

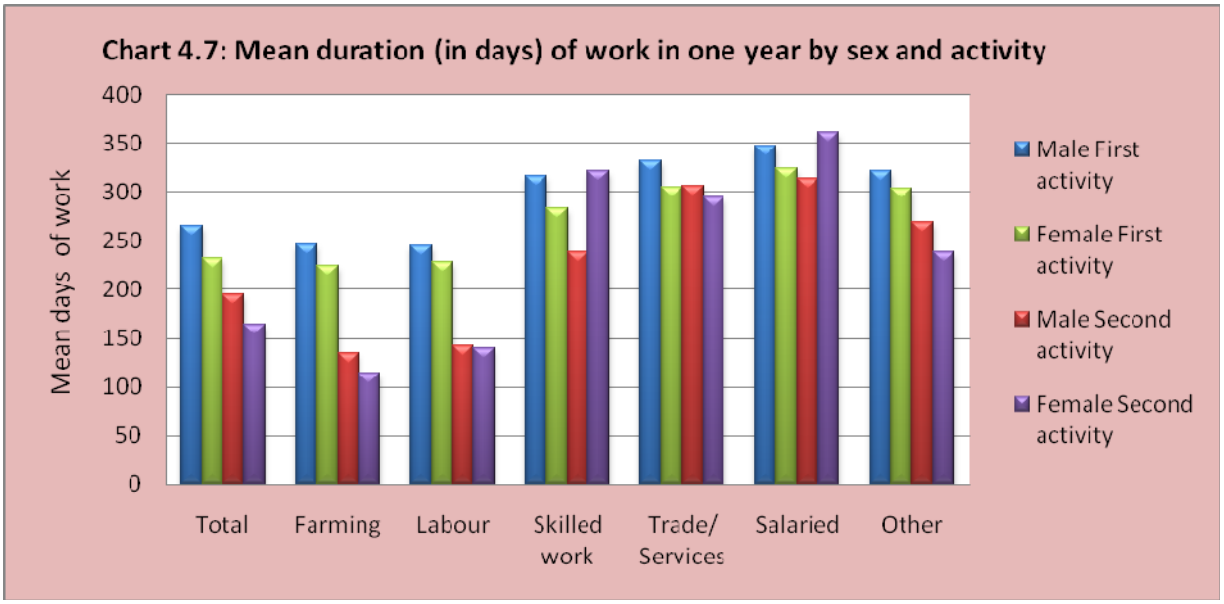
percent among females. On the other hand the proportion worked as labourer only (in agriculture and/or non-agriculture sector) in different age groups was 20-35 percent among males but 35-45 percent among females. At the same time 10-15 percent among males and among females worked as cultivator and also as labourer during the one year period before the survey. On the other hand a substantial proportion of 20-25 percent males and very few females worked as in a combination of artisan, trader and/or salaried.

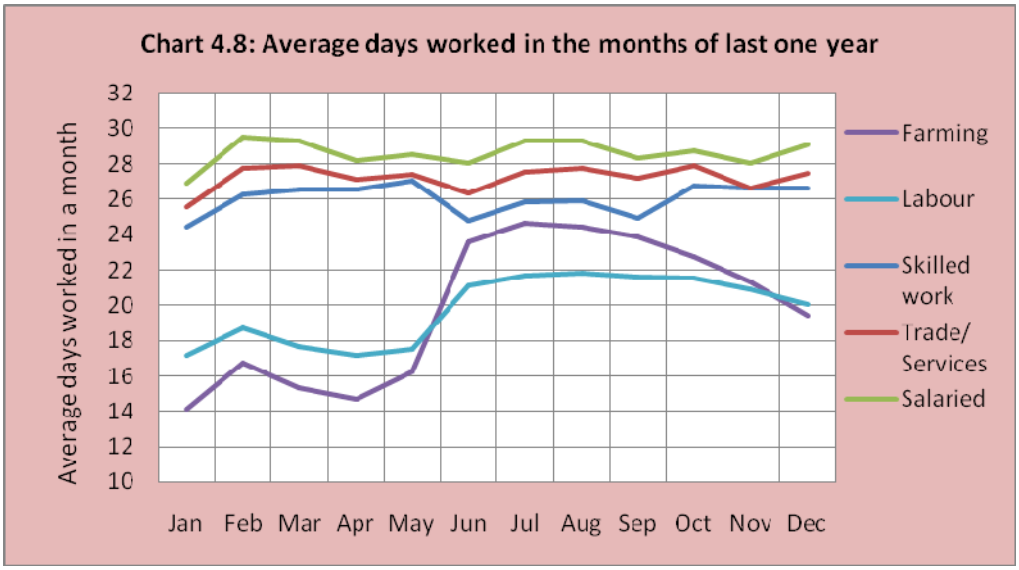
4.3.3: Differentials in Economic Activities

Table 4.11 gives percent of persons age 6+ engaged in economic activity by type of occupation, classified by caste class, type of family and cultivated holding. The table shows that overall there is no large variation in the proportion of males engaged in economic activity by caste class, type of family and cultivated holding. The proportion of males and females engaged in own farm activity (as cultivator) was relatively less and proportion engaged as labourer was relatively higher among SC/STs, coupleless families and landless families as compared to their counterparts.

4.3.4: Duration of work and Seasonal variation

Table 4.12 gives duration of work by first and second activity classified by sex. It is seen from the table that in respect of first activity more than 70 percent of the male workers and 60 percent of female workers worked all the 12 months during the last one year. Forty to fifty of those who were engaged in second activity also worked for 12 months. However it does not mean that they work for all the days of each month. On average the main occupation was performed for around 250 days in the last one year, 266 days by male workers and 232 days by female workers. The duration of secondary work was 195 days by males and 164 days by females.





With respect to seasonal variation in work, charts 4.8 shows that those who engaged in own farming worked for about 25 days a month during June to October and thereafter the number of days worked per month decreased and reached a low level of about 10 to 15 days a month during January to May. The pattern was almost the same for labourers but the variation in the number of days worked per month varied from 16 to 22 days per month during different seasons. On the other hand persons engaged in other occupations such as skilled work, trade/services and salaried employment varied from 25 to 30 days a month during the whole one year. It appears that agricultural works, both own farming and labourer work, are much volatile as compared to work in other sectors.

Table 4.1: Percent distribution of 7+ age group persons by literacy and educational level, classified by sex and age

Educational level (Std)	Age group					
	7+	15-59	7-14	15-24	25-59	60+
Male						
Illiterate	11.5	8.5	1.4	1.9	11.6	39.1
Below Primary (1-4)	17.3	9.3	46.5	3.1	12.2	22.7
Primary Complete (5-7)	17.5	12.7	39.3	9.0	14.5	15.4
Middle Complete (8-9)	14.6	17.0	12.9	23.6	13.8	4.5
High/Higher sec (10-12)	27.4	36.1	-	42.2	33.3	15.6
College+ (13-19)	9.8	13.6	-	15.4	12.7	2.3
Engineering	0.4	0.6	-	1.1	0.4	0.1
Medical/Health	0.2	0.3	-	0.1	0.3	0.0
Post SSLC Diploma	1.4	1.9	-	3.6	1.2	0.3
High school+	39.2	52.5	-	62.5	47.8	18.4
College entered+	11.8	16.4	-	20.2	14.5	2.8
Total (%)	100.0	100.0	100.0	100.0	100.0	100.0
Weighted cases	9445	6605	1564	2114	4491	1277
Unweighted cases	9784	6921	1509	2201	4720	1354
Female						
Illiterate	28.0	23.8	1.5	4.9	31.6	78.5
Below Primary (1-4)	18.1	11.8	49.9	4.8	14.7	13.4
Primary Complete (5-7)	19.0	17.6	36.6	11.0	20.3	5.8
Middle Complete (8-9)	11.3	13.3	12.0	20.0	10.6	0.8
High/Higher sec (10-12)	18.5	26.2	-	45.1	18.5	1.3
College+ (13-19)	4.6	6.6	-	12.9	4.0	0.1
Engineering	0.0	0.1	-	0.1	0.0	0.0
Medical/Health	0.1	0.1	-	0.0	0.2	0.0
Pre-Post SSLC Diploma	0.4	0.6	-	1.3	0.3	0.2
High school+	23.6	33.5	-	59.4	22.9	1.5
College entered+	5.1	7.3	-	14.3	4.4	0.3
Total (%)	100.0	100.0	100.0	100.0	100.0	100.0
Weighted cases	9024	6297	1450	1831	4466	1278
Unweighted cases	9122	6387	1424	1855	4532	1311

Table 4.2: Percent distribution of household members of age 7+ and of age 15-59 by educational level, classified by sex, caste class and cultivated holding of household.

Education level	Caste class				Cultivated holding				
	Total	SC/STs	OBC/SBC	General	Nil	0.1-2.5	2.6-5.0	5.1-10.0	10.1+
7+ Age group									
Male									
Illiterate	11.5	15.9	9.4	9.2	14.4	11.0	9.5	8.3	5.9
Below Primary (1-4)	17.3	20.0	18.1	14.0	18.9	18.1	15.1	15.3	14.0
Primary Complete (5-7)	17.5	17.5	18.2	16.9	18.2	18.9	16.6	15.0	14.6
Middle Complete (8-9)	14.6	16.3	13.7	13.8	15.0	15.6	14.6	14.1	8.4
High/Higher secondary	27.4	22.2	29.5	30.3	23.3	27.5	31.9	30.8	32.4
College/Professional	11.8	8.2	11.1	15.7	10.1	8.8	12.4	16.5	24.7
Female									
Illiterate	28.0	35.5	24.7	23.7	33.1	28.4	23.9	21.7	13.9
Below Primary (1-4)	18.1	20.6	17.5	16.4	19.3	17.8	17.7	17.6	13.6
Primary Complete (5-7)	19.0	17.3	18.6	20.8	17.8	20.7	19.9	18.9	17.6
Middle Complete (8-9)	11.3	10.1	12.5	11.4	10.4	12.6	11.8	11.0	11.8
High/Higher secondary	18.5	13.4	20.8	21.2	15.4	16.3	21.0	24.5	29.7
College/Professional	5.1	3.0	5.9	6.5	3.9	4.2	5.7	6.3	13.5
15-59 Age group									
Male									
Illiterate	8.5	13.2	7.4	5.2	12.0	7.8	5.9	5.0	2.6
Below Primary (1-4)	9.3	11.8	10.4	6.0	11.0	10.3	7.6	5.9	6.2
Primary Complete (5-7)	12.7	13.9	13.0	11.4	14.1	14.5	10.9	10.8	6.7
Middle Complete (8-9)	17.0	19.5	15.6	15.9	18.0	18.3	16.4	15.1	10.2
High/Higher secondary	36.1	30.3	38.3	39.5	30.7	37.2	42.3	40.3	39.6
College/Professional	16.4	11.3	15.3	22.0	14.3	11.9	16.9	22.9	34.7
Female									
Illiterate	23.8	35.1	19.9	16.9	30.8	24.7	17.3	14.7	8.7
Below Primary (1-4)	11.8	12.9	11.7	10.9	12.3	12.9	11.7	10.8	6.2
Primary Complete (5-7)	17.6	15.9	16.6	20.0	16.5	19.4	18.4	17.9	14.6
Middle Complete (8-9)	13.3	12.5	14.7	12.9	12.7	14.0	14.4	13.1	11.7
High/Higher secondary	26.2	19.4	28.9	30.0	22.0	23.0	30.0	34.6	40.4
College/Professional	7.3	4.2	8.2	9.3	5.7	6.0	8.1	8.9	18.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 4.3: Percent of 3-24 age group persons studying, percent dropped out and percent never attended school by age and sex.

School/college attendance	Age group						
	3-24	6-19	3-5	6-9	10-14	15-19	20-24
All							
Studying	64.5	86.2	45.0	95.4	96.8	67.9	20.6
Dropped out this year	0.7	0.7	0.0	0.0	0.2	1.9	1.1
Dropped out last year or before	25.6	10.9	0.0	0.3	2.1	28.1	74.2
No schooling	9.2	2.2	55.0	4.2	0.9	2.1	4.2
Total (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Male							
Studying	65.4	86.9	47.0	95.5	96.7	69.8	25.6
Dropped out this year	0.9	0.8	0.0	0.0	0.1	2.0	1.8
Dropped out last year or before	25.3	10.8	0.0	0.2	2.5	27.5	70.2
No schooling	8.4	1.6	53.0	4.3	0.6	0.7	2.4
Total (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Female							
Studying	63.5	85.4	42.5	95.4	96.9	65.8	14.2
Dropped out this year	0.5	0.7	0.0	0.0	0.2	1.7	0.3
Dropped out last year or before	25.9	11.1	0.0	0.4	1.7	28.9	79.1
No schooling	10.0	2.8	57.5	4.2	1.1	3.5	6.4
Total (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 4.4: Reasons for drop out from school by children of age 6-17 years, by sex			
Reason for drop out	Total	Male	Female
Too poor in studies/failed/irregular to school	26.4	25.8	27.0
To work and support household	24.0	30.4	17.2
Required to attend domestic chores	12.5	6.0	19.4
Education / higher education not (consider) important	11.8	5.9	17.9
Too high fees/expenses	5.7	8.3	3.1
Frequent shifting of residence	4.4	5.8	2.9
Required to work or manage family farm	4.3	8.0	0.5
Physical/mental disability/illness	3.5	3.8	3.2
School too far and no adequate transport/sending girls not safe	2.1	2.3	2.0
Poor quality of teaching/teachers not available or rude	0.7	1.3	0.1
Others	4.8	2.5	7.3
Valid weighted cases (reason stated)	274	140	134
Note: Multiple responses applicable.			

Table 4.5: Percent of children studying in the age group 3-24 by age and sex, classified by Caste class.				
Sex/Age group	Caste class			
	All	SC/STs	OBC/SBC	General
Male				
3-5	47.0	37.9	48.9	53.3
6-9	95.5	93.9	95.7	97.0
10-14	96.7	94.6	98.2	97.6
15-19	69.8	63.7	70.9	75.4
20-24	25.6	20.1	24.4	32.2
3-24	65.4	61.5	64.9	69.8
Female				
3-5	42.5	33.5	58.4	41.6
6-9	95.4	95.5	96.4	94.4
10-14	96.9	93.8	98.7	98.8
15-19	65.8	51.9	72.5	74.0
20-24	14.2	10.3	12.4	19.7
3-24	63.5	58.7	65.6	67.0

Table 4.6: Percent distribution of students (of age group 7-24 who attended school/college during the 2010-11 academic year) by distance to the institution, type of institution, medium of instruction and place of stay for study by standard attended and sex of student.

Education facilities	Male				Female			
	Primary School	Middle School	High/ Hr Sec	College/ Technical	Primary School	Middle School	High/ Hr Sec	College/ Technical
Total (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Distance to institution								
Village/<1 km	74.2	62.6	35.0	2.3	80.7	63.0	36.1	6.9
1-5 kms	16.0	23.1	29.9	10.6	14.1	25.4	31.6	14.5
6-20 kms	5.8	9.5	21.6	34.3	2.9	7.1	21.4	42.7
21-49 kms	1.5	2.3	8.3	18.0	1.5	2.6	6.2	13.0
50-99 kms	1.5	1.5	3.0	16.6	0.7	1.0	3.0	11.7
100+ kms	0.9	1.0	2.2	18.3	0.2	0.8	1.8	11.2
Educational institution								
Government	66.3	39.5	24.9	25.2	72.6	44.6	25.1	20.6
Govt Aided	25.8	53.8	64.7	51.8	23.8	50.2	65.7	60.4
Private	7.4	4.5	9.2	22.7	3.2	4.6	8.4	18.4
Charitable	0.6	2.2	1.2	0.3	0.4	0.6	0.9	0.7
Medium of instruction								
Marathi	90.1	94.3	87.8	61.7	95.3	92.4	90.4	68.4
English	7.6	4.5	10.3	37.2	2.9	4.7	6.5	29.9
Hindi	0.2	0.1	0.7	0.7	0.3	0.8	0.2	1.7
Semi-English	0.8	0.3	0.3	0.0	0.6	0.2	0.6	0.0
Urdu	0.8	0.7	0.3	0.4	0.6	1.2	2.0	0.0
Other	0.6	0.1	0.6	0.0	0.3	0.8	0.3	0.0
Where stayed for study								
Parents home	95.5	94.4	90.6	64.1	97.7	94.7	91.4	72.5
Relative/friend	3.3	3.4	4.1	3.4	1.9	4.6	3.9	1.8
Hostel/rented	1.2	2.2	5.2	32.6	0.4	0.7	4.6	25.6

Table 4.7: Percent distribution of students who attended school/college last academic year by amount of scholarship received, and institutional and personal expenses on education in one year, by school/college attended and sex of student.

Education expenses	Male				Female			
	Primary School	Middle School	High/ Hr Sec	College/ Tech	Primary School	Middle School	High/ Hr Sec	College/ Tech
Total (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Institution, tuition fees, books, etc								
Nil	8.8	7.3	3.3	0.8	10.5	4.6	1.1	3.8
Rs. 1-500	55.8	22.9	5.5	0.9	55.2	25.4	4.0	2.1
Rs. 501-1000	18.1	37.3	19.8	2.6	20.5	35.8	18.3	4.9
Rs. 1001-2000	7.6	22.7	27.0	16.6	7.9	22.9	32.7	12.1
Rs. 2001-5000	4.2	7.2	28.2	24.7	4.4	8.7	30.6	21.1
Rs. 5001-10000	3.0	1.4	11.2	11.8	1.0	1.2	8.5	19.7
Rs. 10001-20000	1.7	0.7	3.5	14.8	0.4	1.0	3.3	16.1
Rs. 20001-50000	0.8	0.4	1.3	20.6	0.0	0.3	1.1	15.8
Rs. 50001+	0.0	0.0	0.3	7.2	0.0	0.0	0.4	4.5
Mean (Rs)	1,694	1,762	4,245	18,208	978	1,484	4,286	15,921
Median (Rs)	637	775	1,775	4,920	609	753	1,722	4,568
Stay, food, transport, etc								
Nil	88.7	86.2	63.9	16.8	94.8	90.6	69.2	18.7
Rs. 1-500	1.6	1.7	3.0	1.9	1.3	3.9	4.1	1.8
Rs. 501-1000	2.5	2.3	4.2	3.5	0.3	0.9	3.8	4.2
Rs. 1001-2000	1.5	3.1	9.5	13.4	1.1	0.7	7.6	17.6
Rs. 2001-5000	4.1	5.4	14.3	27.8	1.7	3.0	11.5	27.5
Rs. 5001-10000	0.9	0.8	3.1	12.9	0.7	0.6	2.2	14.2
Rs. 10001-20000	0.5	0.4	1.4	11.5	0.1	0.3	1.1	4.6
Rs. 20001+	0.1	0.1	0.5	12.2	0.0	0.0	0.5	11.4
Mean (Rs)	3,356	2,832	4,029	10,199	3,144	2,095	3,887	8,389
Median (Rs)	2,401	1,940	2,495	4,484	2,651	951	2,111	3,551
Scholarship received								
Nil	99.1	98.9	89.1	69.5	90.0	85.8	85.5	79.8
Rs. 1-500	0.2	0.6	1.1	0.6	8.1	1.9	1.2	0.3
Rs. 501-1000	0.7	0.4	4.4	4.3	1.8	11.8	9.4	3.4
Rs. 1001-2000	0.0	0.0	3.8	7.3	0.1	0.4	3.1	8.0
Rs. 2001-5000	0.0	0.0	1.6	7.2	0.0	0.0	0.6	4.9
Rs. 5001-10000	0.0	0.0	0.0	4.4	0.0	0.0	0.2	1.5
Rs. 10001+	0.0	0.0	0.1	6.8	0.0	0.0	0.0	2.2
Mean (Rs)	863	730	1,568	7,159	454	740	1,156	3,871
Median (Rs)	901	751	947	2,418	340	587	924	1,476

Table 4.8: Percent of household members (6+ age group) engaged in economic activity by age and sex.

Age group	Male	Female	Combined
06-09	0.2	0.0	0.1
10-14	2.5	2.2	2.3
15-19	26.6	15.9	21.4
20-24	70.6	37.6	56.0
25-29	91.2	55.2	73.5
30-34	97.8	71.6	84.9
35-39	99.0	81.9	90.5
40-44	96.7	76.2	87.0
45-49	99.0	73.4	85.3
50-54	96.1	71.9	84.8
55-59	90.1	51.4	69.5
60-64	79.0	50.7	63.4
65-69	70.0	40.0	55.5
70-74	47.9	16.7	33.1
75-79	36.8	8.5	23.7
80+	9.2	1.8	5.8
6-14	1.6	1.3	1.5
15-24	51.0	26.9	39.8
25-49	96.3	70.5	83.5
50-64	88.9	57.1	72.5
65+	51.6	24.7	38.8
All (6+)	64.2	43.6	54.1

Table 4.9: Nature of activity of household members (all order activities combined) by sex and age.					
Nature of activity	All (6+)	15-24	25-49	50-64	65+
Total	100.0	100.0	100.0	100.0	100.0
Male					
Farming (own farm activities)	42.8	33.6	40.6	52.9	58.3
Agriculture labour	28.2	36.4	26.7	26.4	24.2
Petty business/trade	7.6	5.1	9.1	5.6	7.5
Self employed skilled work (driving/plumping/electrical/etc)	5.0	7.1	5.8	1.7	0.9
Non-agriculture labour (excluding NREGA)	4.0	6.4	4.5	1.5	0.9
Salaried (Clerical category)	3.5	2.8	3.8	4.6	0.5
Salaried (Labour category)	2.7	3.9	2.9	1.4	1.2
Salaried (supervisor/professional)	2.3	0.7	3.0	2.3	0.0
Traditional work (Artisan/craftsman/household industry)	2.3	2.0	2.0	2.7	3.9
Contractor/broker	1.0	1.5	1.0	0.6	1.3
Milk/animal business and related/Other	0.4	0.2	0.5	0.2	1.3
Local services (Poojari/matrimony/traditional services)	0.1	0.1	0.1	0.2	0.0
NREGA/MREGS work	0.1	0.2	0.0	0.1	0.0
Female					
Farming (own farm activities)	48.2	43.8	48.1	52.7	45.5
Agriculture labour	42.5	46.2	41.8	41.6	42.3
Petty business/trade	3.3	1.2	4.2	1.4	3.9
Self employed skilled work (driving/plumping/electrical/etc)	0.4	1.3	0.4	0.0	0.0
Non-agriculture labour (excluding NREGA)	0.9	1.3	1.0	0.3	0.3
Salaried (Clerical category)	1.0	0.3	1.3	0.5	0.0
Salaried (Labour category)	1.2	1.5	1.4	0.8	0.0
Salaried (supervisor/professional)	0.6	0.4	0.6	0.9	0.0
Traditional work (Artisan/craftsman/household industry)	1.5	3.7	1.0	1.0	4.9
Contractor/broker	0.1	0.1	0.1	0.0	0.0
Milk/animal business and related/Other	0.4	0.3	0.1	0.7	3.1
Local services (Poojari/matrimony/traditional services)	0.0	0.0	0.0	0.0	0.0
NREGA/MREGS work	0.0	0.0	0.0	0.1	0.0

Table 4.10: Percent distribution of workers by order and nature of activity and work participation rate by activity, classified by sex and age

Economic activities (last one year)	Male					Female				
	All (6+)	15-24	25-49	50-64	65+	All (6+)	15-24	25-49	50-64	65+
Total (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Any activity	64.2	51.0	96.3	88.9	51.6	43.6	26.9	70.5	57.1	24.7
Number of activities										
One	77.2	80.7	74.6	77.5	87.1	82.3	88.7	80.1	82.2	92.5
Two+	22.8	19.3	25.4	22.5	12.9	17.7	11.3	19.9	17.8	7.5
First activity										
Own farming	51.0	38.3	49.3	63.1	65.5	56.1	48.6	56.9	61.5	48.6
Agri/nonagri labour	26.6	38.2	25.3	20.9	20.3	36.6	43.6	35.5	33.7	39.0
Self employed/traditional work	7.3	9.8	7.7	4.3	5.2	1.7	4.1	1.3	0.9	5.2
Business/Contract/Services	6.2	5.7	6.8	4.6	7.4	2.4	1.0	2.9	1.2	3.9
Salaried	8.6	7.8	10.4	7.0	0.6	2.7	2.4	3.3	1.8	0.0
Other	0.3	0.1	0.4	0.1	0.9	0.4	0.3	0.1	0.8	3.3
Second activity										
Own farming	8.0	9.5	8.2	7.4	2.6	3.9	1.3	4.4	3.0	4.7
Agri/nonagri labour	57.5	67.4	54.4	59.0	61.7	82.4	81.6	80.5	88.9	91.2
Self employed/traditional work	6.8	5.3	8.1	4.8	1.8	2.8	12.5	2.2	1.2	0.0
Business/Contract/Services	18.6	11.6	21.5	14.2	19.7	7.9	4.2	9.8	2.7	4.1
Salaried	8.1	5.5	7.1	13.7	9.9	3.0	0.4	3.0	4.2	0.0
Other	0.9	0.7	0.8	0.8	4.2	0.1	0.0	0.1	0.0	0.0
Combination of activities										
Farming only	32.1	24.3	27.9	44.3	53.5	40.0	38.8	38.9	44.9	41.4
Farming + labour	12.4	11.7	13.3	12.7	7.5	14.8	9.4	16.4	15.6	7.2
Farming + other than labour	7.2	3.4	8.8	7.0	4.9	1.9	0.5	2.4	1.3	0.3
Labour (only or mainly)	25.5	36.4	24.2	20.3	20.3	35.6	43.4	34.2	33.2	38.6
Salary/business/services	22.7	24.3	25.8	15.7	13.8	7.6	7.8	8.1	4.9	12.4
Work participation rate										
Farming only	20.6	12.4	26.9	39.4	27.6	17.5	10.4	27.4	25.7	10.3
Farming + labour	8.0	5.9	12.8	11.2	3.9	6.5	2.5	11.5	8.9	1.8
Farming + other than labour	4.6	1.7	8.5	6.2	2.6	0.8	0.1	1.7	0.8	0.1
Labour (only or mainly)	16.4	18.5	23.3	18.1	10.5	15.5	11.7	24.1	19.0	9.6
Salary/business/services	14.6	12.4	24.8	14.0	7.1	3.3	2.1	5.7	2.8	3.1

Table 4.11: Work participation rate by type of activity, classified by caste class, type of family and cultivated holding						
Characteristics	All activities	Farming only	Farming + labour	Farming + other than labour	Labour (only or mainly)	Salary/ business/ services
		Males				
Total	64.2	20.6	8.0	4.6	16.4	14.6
Caste Class						
SC/STs	63.9	12.9	7.0	2.8	27.6	13.7
OBC/SBC	65.2	19.8	10.5	5.4	14.5	15.0
General	63.7	28.4	6.7	5.6	7.9	15.1
Type of family						
Coupleless/UniMem	61.5	11.4	6.9	0.4	25.1	17.7
Strictly nuclear	60.9	17.7	8.9	4.3	18.5	11.4
Extended nuclear	60.1	15.1	8.0	5.6	16.5	14.9
Joint family(verti only)	68.7	24.3	8.4	4.3	15.3	16.5
Joint family(horiz/vert)	70.1	29.1	4.8	5.8	11.2	19.3
Cultivated holding						
Nil	62.1	0.2	0.1	0.4	37.4	23.9
Marginal (<=2.5)	66.5	24.6	20.5	7.9	4.7	8.7
Small (2.6-5.0)	64.0	34.9	12.0	7.3	1.4	8.4
Semi-Medium (5.1-10)	66.5	45.9	6.9	5.9	0.3	7.5
Medium/Large (10.1+)	67.4	47.7	1.0	8.9	0.4	9.3
		Females				
Total	43.6	17.5	6.5	0.8	15.5	3.3
Caste Class						
SC/STs	44.5	11.2	5.6	0.7	24.2	2.8
OBC/SBC	46.7	17.9	8.4	0.8	15.4	4.1
General	40.2	22.9	5.6	1.0	7.6	3.1
Type of family						
Coupleless/UniMem	70.1	8.0	7.7	2.4	40.8	11.2
Strictly nuclear	47.9	15.8	8.0	0.9	19.7	3.5
Extended nuclear	36.3	12.1	6.9	1.0	12.9	3.5
Joint family(verti only)	40.7	20.6	6.3	0.6	11.2	2.1
Joint family(horiz/vert)	39.3	24.7	2.4	0.4	9.1	2.7
Cultivated holding						
Nil	40.0	0.2	0.0	0.1	33.9	5.8
Marginal (<=2.5)	47.9	23.3	17.3	1.3	4.6	1.5
Small (2.6-5.0)	45.6	31.4	9.9	1.3	1.1	1.9
Semi-Medium (5.1-10)	47.1	38.3	5.9	1.7	0.3	0.8
Medium/Large (10.1+)	39.9	36.1	0.6	1.2	0.0	2.0

Table 4.12: Duration of work in the last one year by activity and order								
Activity and order	Male							
	Total	<3 months	3-5 months	6-8 months	9-11 months	12 months	Mean days	Median days
				Males				
First activity								
Total	100.0	0.3	5.1	18.2	4.2	72.2	266	207
Farming (own farm activities)	100.0	0.2	8.4	27.7	4.3	59.4	246	173
Agri/non-agriculture labour	100.0	0.4	2.2	12.0	6.0	79.4	245	221
Skilled/Traditional work	100.0	0.0	1.8	8.0	3.2	87.0	317	246
Trade/Contractor/Services	100.0	0.0	1.5	2.0	2.2	94.3	332	277
Salaried (all types)	100.0	0.2	0.2	1.6	0.9	97.2	347	303
Other	100.1	0.0	12.0	0.0	2.3	85.8	322	202
Second+ activity								
Total	100.0	2.2	15.1	26.1	5.7	50.9	195	129
Farming (own farm activities)	100.0	1.1	33.2	32.1	6.6	27.0	134	83
Agri/non-agriculture labour	100.0	2.2	17.7	36.6	6.8	36.6	142	128
Skilled/Traditional work	100.0	1.3	14.2	15.5	2.9	66.1	238	156
Trade/Contractor/Services	100.0	1.0	5.2	6.0	4.8	83.0	306	189
Salaried (all types)	100.0	7.5	3.2	6.2	1.3	81.8	314	172
Other	99.9	3.0	10.8	0.0	10.8	75.3	270	117
				Females				
First activity								
Total	100.0	0.6	8.6	23.8	5.7	61.3	232	183
Farming (own farm activities)	100.0	0.6	11.5	31.2	6.2	50.5	224	156
Agri/non-agriculture labour	100.0	0.4	5.4	15.6	5.4	73.2	228	205
Skilled/Traditional work	100.0	6.1	8.3	4.4	0.0	81.2	284	139
Trade/Contractor/Services	100.0	0.7	0.5	10.7	1.2	86.8	306	226
Salaried (all types)	100.0	0.0	0.5	2.6	8.1	88.8	324	294
Other	100.0	0.0	0.0	35.0	0.0	65.0	304	216
Second+ activity								
Total	100.0	1.3	15.2	33.4	8.2	41.9	164	121
Farming (own farm activities)	100.0	0.0	25.9	28.7	27.5	17.9	114	101
Agri/non-agriculture labour	100.0	1.6	16.5	37.8	8.3	35.8	140	122
Skilled/Traditional work	100.1	0.0	0.0	0.0	8.8	91.3	322	154
Trade/Contractor/Services	100.0	0.0	7.4	15.4	0.4	76.8	295	145
Salaried (all types)	100.0	0.0	0.0	0.0	0.0	100.0	362	355
Other	100.0	0.0	0.0	100.0	0.0	0.0	239	236

CHAPTER 5:
Drip and Sprinkler Installations

In this chapter various aspects of agricultural practices such as landholding, cultivated holding, irrigated holding, drip and sprinkler irrigated holding, and seasonal and perennial/plantation crops cultivated during the agriculture year from June 2010 to May 2011 including area under cultivation, crop yield, value of yield and expenditure on cultivation, sale of produce and experience of crop failure, are discussed.

5.1: Landholding Pattern

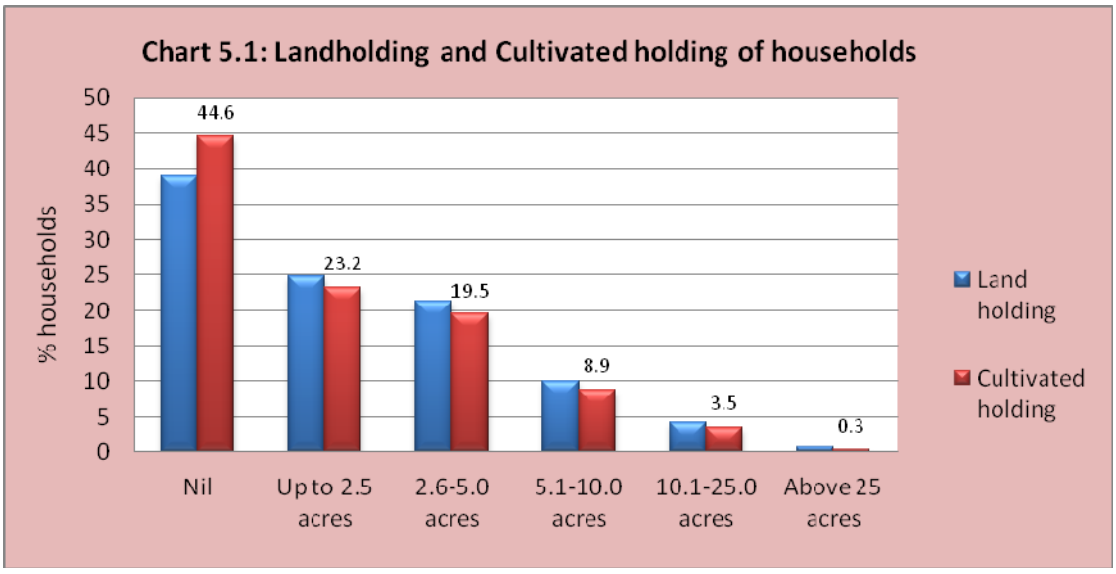
In this survey various aspects of landholding are considered and the aspects covered and procedures adopted are discussed. First the respondents were asked "Do you or any of your household members own any agricultural land including any land under plantation and any land mortgaged?" The respondents were further asked "Are you or any of your family members are entitled to any agricultural land but not accessed or not in the possession of your household?" The next two questions asked were "Do you have any leased-in or contractual land?" and "Are you in possession of any government or forest land by way of long use?" If the answer to any of these questions was 'yes', the respondents were asked details about each piece of land. The details sought in respect of each piece of land were: location of the land (brief address, just to refer to seek details), type of land (Irrigated, non-irrigated, cultivable fallow, uncultivable/barren and other types), land area (in acres), who owns or is entitled to the land (member identification number to know whether it is a male or female and his/her relationship with the head of the household), type of access (owned and accessed, entitled but not accessed, leased-in/contractual, by way of long use of government/forest land), area of the land cultivated by the household (in full, in part, or nil), in case of joint cultivated share of the household, and the reasons for not cultivating whole or other part the land.

It is to be noted that, as stated under study design, the landholding pattern (cultivated holding, irrigated holding and drip/sprinkler irrigated holding, and also cultivation) excludes 11 districts (one-third of Maharashtra) where drip/sprinkler penetration was very low. Further, it excludes urban residents having agricultural land and cultivation, who are not covered in this survey.

5.1.1: Landholding Pattern

Table 5.1 and chart 5.1 give percent distribution of households by size of landholding and by cultivated holding. It is to be noted that landholding was defined as the size of land owned and/or entitled to by any member of the household and cultivated holding was defined as the size of land being cultivated by the household irrespective of ownership. As such landholding includes leased out land but includes land not in possession but entitled to have a share in it, and cultivated holding excludes leased out land and land not in possession for own cultivation but includes leased in land.

As per the statement of the respondents, overall 61 percent of the households owned agricultural land but only 55 percent of the households cultivated land. Further in the study population 23 percent of the households cultivated only up to 2.5 acres of land (called marginal farmers), 20 percent of the households cultivated more than 2.5 acres but up to 5 acres of land (called small farmers), another 9 percent of the households cultivated more than 5 acres but up to 10 acres of land (called semi-medium farmers), and only 4 percent of the households cultivated more than 10 acres of land (called medium/large farmers). Large farmers with more than 25 acres of cultivated holding were very few, below 1 percent. Among the farmers, 42 percent were marginal farmers, 35 percent were small farmers, 16 percent were semi-medium farmers and only 7 percent were medium/large farmers (Table 5.2a).



5.1.2: Type of Cultivated Holding

We have considered type cultivated holding in three categories namely drip/sprinkler irrigation, flood irrigation and rain-fed cultivation. Table 5.2a gives percent distribution of households/farmers by size of cultivated holding, irrigated holding and drip/sprinkler irrigated hold-

ing, classified by study group. Here the study groups are drip/sprinkler irrigated farmer (with or without flood irrigation and/or rain-fed cultivation of part of their land), flood irrigated farmer (with or without rain-fed cultivation in any part of their land), rain-fed cultivated farmer (with no flood/drip/sprinkler irrigation) and landless households (including a few landholding but not cultivating households).

The average landholding was 4.7 acres per landholding household and it increased from 3.4 acres for rain-fed cultivated household, 4.9 acres per flood irrigated household and as much as 7.8 acres per drip/sprinkler irrigated household. Similarly, the average cultivated holding was 4.4 acres per cultivated holding household (farmer) and it increased from 3.0 acres for rain-fed cultivated farmer, 4.6 acres per flood irrigated farmer and 7.1 acres per drip/sprinkler irrigated farmer. The proportion of cultivated land that was irrigated was 53 percent and that drip/ sprinkler irrigated was just 14 percent. Similarly the proportion of irrigated land that was drip/sprinkler irrigated was only 27 percent. This shows that there is large need and scope for drip/sprinkler irrigation. However, of the 4.6 acres per flood irrigating farmer, as much as 3.4 acres (about 75 percent) was flood irrigated but of the 7.1 acres per drip/sprinkler irrigating farmer only 3.4 acres (less than 50 percent) was drip/sprinkler irrigated.

5.1.3: Cultivated Holding pattern by Farmer category

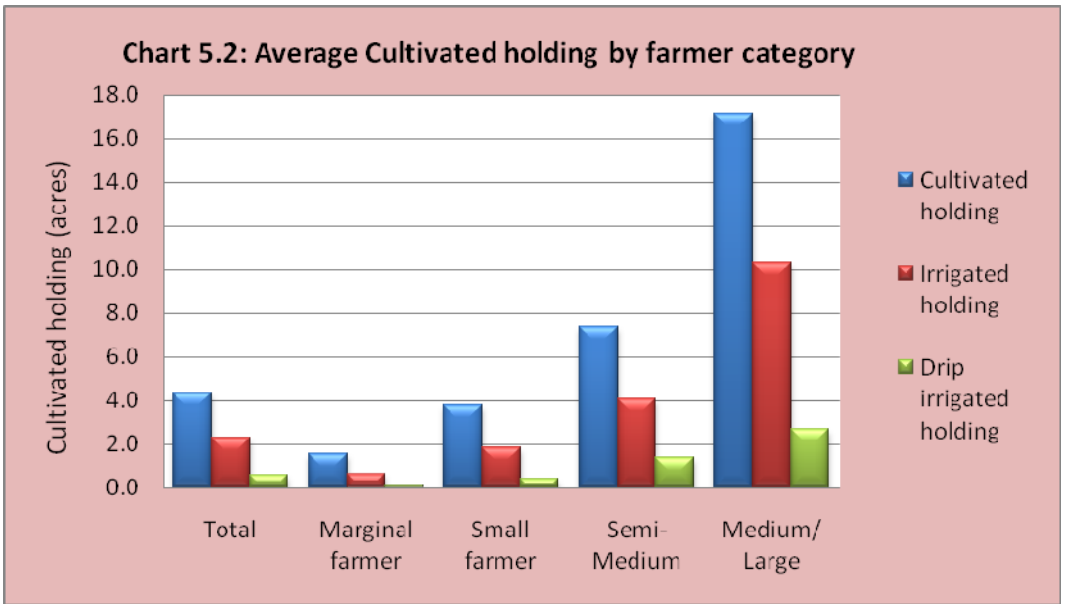
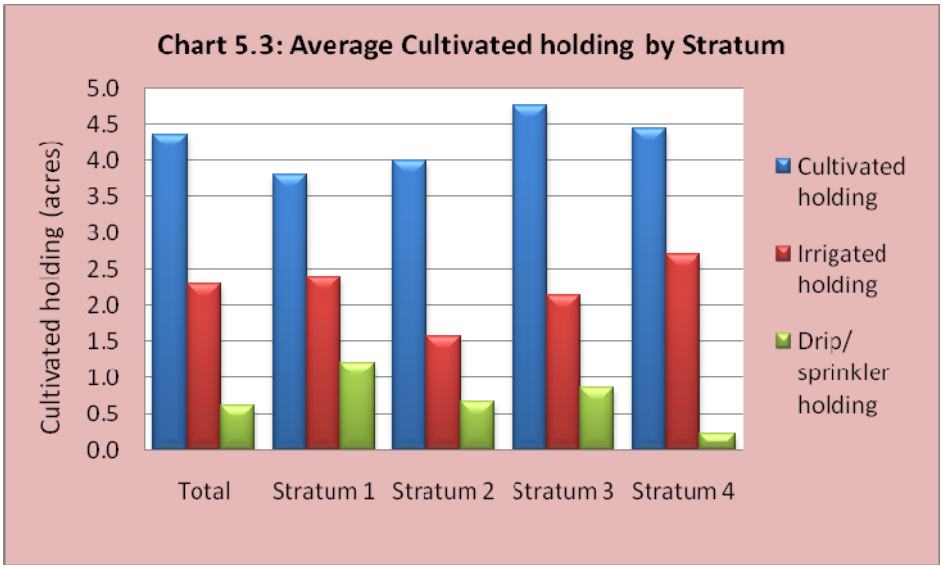


Table 5.2b gives percent distribution of farmers by size of cultivated holding, irrigated holding, and drip/sprinkler irrigated holding, classified by farmer category and chart 5.2 gives average holdings by farmer category. It is seen from the chart that the average cultivated holding per farmer was 4.4 acres and only 18 percent of the farmers had drip/sprinkler irrigated holding. The proportion of farmers having drip/sprinkler irrigated holding was just 8 percent among

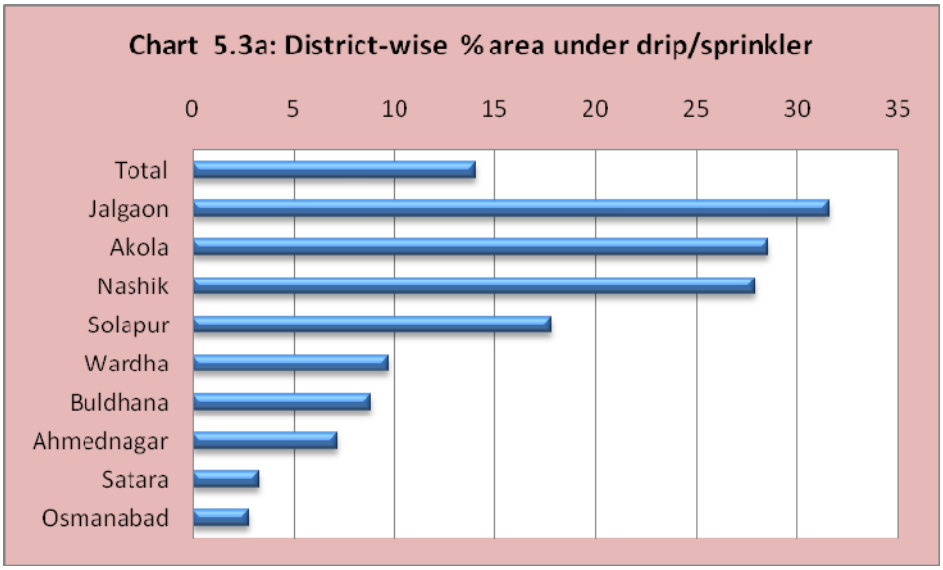
marginal farmers, 18 percent among small farmers, 34 percent among semi-medium farmers and 43 percent among medium/large farmers. In terms of land area it was less than half acre per marginal or small farmer, 1.4 acres per semi-medium farmer and 2.7 acres per medium and large farmer. It is to be noted that even among medium/large farmers just 16 percent of their land area was under drip/sprinkler irrigation.

5.1.4: Cultivated Holding pattern by Stratum and District

Table 5.2c gives percent distribution of households/farmers by size of cultivated holding, irrigated holding. Drip/sprinkler irrigated holding classified by stratum and chart 5.3 gives average holdings per farmer by stratum. It is seen from the chart that though the average cultivated holding per farmer in stratum 1 was less (3.9 acres per farmer), as much as 1.2 acres (more than 30 percent) of the land was under drip/sprinkler irrigation. On the other hand in stratum 4, the average cultivated holding was higher at 4.9 acres per farmer and of which just 0.23 acres (less than 5 percent) was irrigated.



Though district-wise estimates are not appropriate as per the study design, an attempt was made only to indicate the penetration of drip/sprinkler irrigation in the study districts and Table 5.3 gives district-wise percent of households and average area of cultivated, irrigated and drip/sprinkler irrigated. It is seen from the table that in Jalgaon district nearly one-third of the cultivated land was drip/sprinkler irrigated, closely followed by Nashik and Akola districts with 28 percent of land area under drip irrigation. The district next in line was Solapur and in all other districts drip penetration was very low.



5.1.5: Irrigation Particulars

Table 5.4 gives irrigation particulars like number of pieces of land irrigated by farmers, irrigated plot area, duration of irrigation, usual source of water, ownership of water source, method of drawing water to the plot, type of cultivation made earlier if duration of irrigation was less than 10 years. Among the farmers having irrigated land, 56 percent had only one irrigated plot, another 27 percent had 2 plots and the remaining 18 percent had 3 or more plots. However more than 87 percent of marginal farmers having irrigated land had only one plot irrigated and it was 78 percent among small farmers. On the other hand 55 percent of semi-medium farmers and 80 percent of medium/large farmers had two or more plots irrigated. Further, among the drip/sprinkler irrigated farmers, more than 50 percent had 2 or more plots.

Among the currently irrigated plots, about two-thirds were under irrigation for more than 20 years but at the same time 28 percent of the plots were brought under irrigation only within the past 10 years. The proportion of plots brought under irrigation within the past 10 years was not much different among different farmer categories and the current type of cultivation as flood irrigation and drip/sprinkler irrigation. This indicates that the recent popularity of drip/sprinkler irrigation has not brought any substantial land conversion from rain-fed or uncultivable land into flood irrigated or drip/sprinkler irrigated land. However most of the recently converted irrigated land was earlier rain-fed cultivated land and just around 5 percent of the plots were earlier fallow or uncultivable land. This also indicates that it is mainly rain-fed cultivated land that was converted into irrigated land and not uncultivable and fallow land into irrigated land.

Regarding source of water for these plots, it was predominantly open well (80 percent) and in another 13 percent of the plots, bore well was used. The proportion of plots that depended on

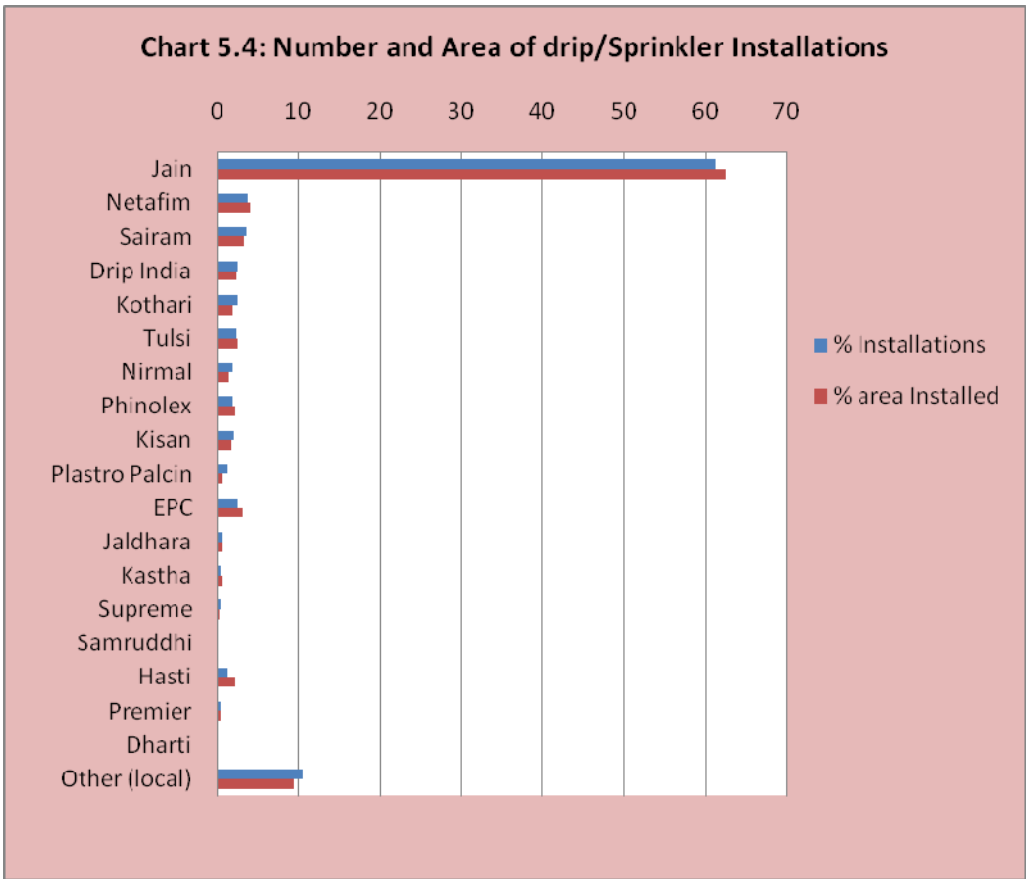
cannel, river/stream, lake/pond and cannel/river lifting was only a few, each 1 to 3 percent only. The pattern did not differ much by type of irrigation and farmer category except an indication that bore well was slightly higher among medium/large farmers. Regarding ownership of water source, it was largely individual sources but shared sources was also substantial (13 percent). However sharing of water was as high as 25 percent among marginal farmers and it progressively decreased to just 5 percent for the plots of medium/large farmers. It means that most large farmers had their own individual water sources whereas a substantial proportion of marginal and small farmers had joint well or bore well to satisfy their irrigation needs. However purchasing of water was rare and often it was not on regular basis. In most of the plots (93 percent) electric pump was used to lift water from the source (often well) and just 2 percent of the plots depended on oil pump or solar system or animal driven system to lift water, while in others it was direct flow into the field.

5.2: Drip and Sprinkler Irrigation

5.2.1: Drip/Sprinkler Brands Installed

Table 5.5 and chart 5.4 give manufacturer-wise share of number of installations and area in which drip/sprinkler installed. Across all the nine districts it was found that drip sets supplied by JAINS were the predominant micro irrigation system adopted by the farmers (61 percent of the installations and 63 percent of the drip/sprinkler installed area), followed by Netafim, EPC, Kothari, Finolex and Tulsi (each just 2 to 4 percent of installations and also of land area). Other companies mentioned were Kissan, Aquaguard, Sun drips and Texmo. Sprinklers by JAIN, Aquaguard, EPC, Hasti and Premier were seen mainly across the Vidarbha region. The factors guiding the choice of drip/sprinkler brand were availability, quality, affordability, popularity, and pre and post installation services.

With respect to year of installation of drip/sprinkler, as table 5.5b indicates, more than 50 percent of the currently active drip/sprinkler sets were installed during the past 2 years, that is since 2009 and in terms of land area it accounted for 45 percent of the drip installed area. Among the active drip/sprinkler sets supplied by Jain, only 45 percent were installed since January 2009 whereas it was 76 percent by Netafirm and the proportion was even higher for many other manufacturers of drip. However it is difficult to say from this which brands are popular because different brands have different longevity. Often it is said that Jain drip sets last longer as compared to many other brands and so it is not required to replace every now and then. In this case even if the number of installations in the recent part were low and makes sense that that the brand is more popular.



5.2.2: Drip/Sprinkler Differentials

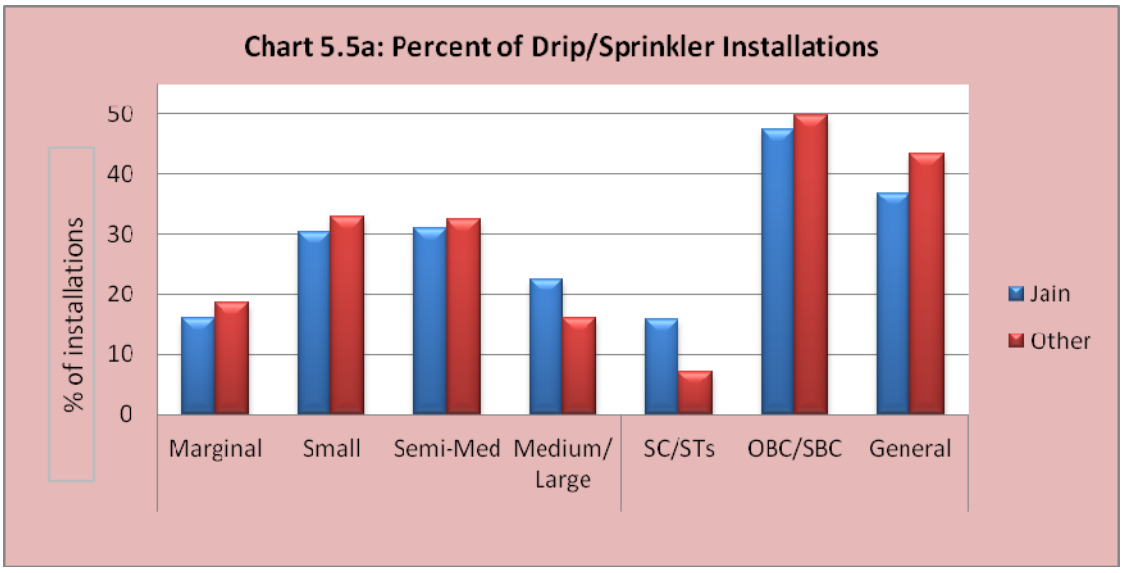
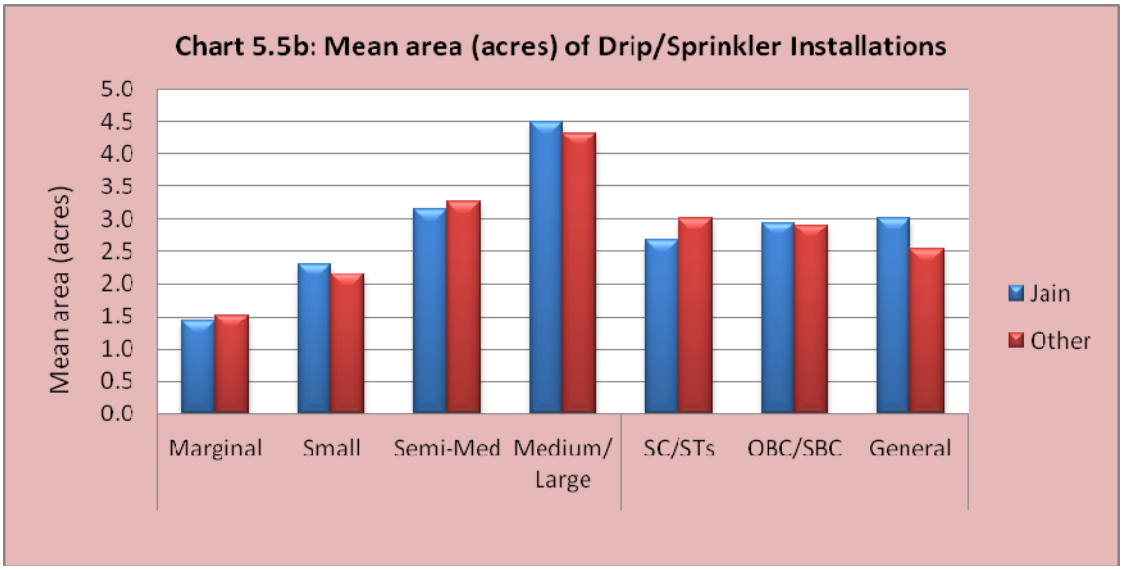


Table 5.6 and charts 5.5a and 5.5b give percent distribution of drip/sprinkler installations and mean area under drip/sprinkler installations by year of installation, farmer category and caste class, classified by manufacturer (Jain and others). It is seen that in each farmer category and caste class, Jain drip/sprinkler had an edge (both in terms of number and area) over all other manufacturers combined.



5.2.2: Drip Cost and Subsidy

Table 5.7 gives cost of drip and related expenses. As cost varies from time to time, the analysis is made by year of installation. Specifically for the drip installations made since January 2009, the cost of drip reported by the farmers worked out to Rs. 22,200 per acre in case of Jain drips as well as other drips. It is to be noted that 'other' drips include locally made drips sets as well. As such the data indicate that Jain drips are comparable to other brand drips in terms of cost. The cost of installation per acre worked out to Rs 1440 in case of Jain drips and it was marginally less at Rs. 1300 in case of other drips. With respect to subsidy, only 66 percent of the Jain drip customers and 59 percent of the other drip customers reportedly received subsidy and the subsidy amount worked out to Rs. 10,400 per acre of drip installed. During the reference period the subsidy was 50 percent of the drip cost under standard specifications and as such the reported amount of subsidy is almost closer to the prescribed rate. Among the Jain customers, nearly one-fourth had installed pump set together with drip installation whereas it was only 15 percent of customers of other brands. It appears that Jain drip dealers advocate on adequate pressure for drip irrigation as compared to other manufacturers and hence a higher proportion of Jain drip customers have installed pump set the take maximum advantage of the drip irrigation, which is a welcome trend.

Table 5.1: Landholding and Cultivated holding of households			
Landholding (acres)	Unweighted households	Weighted	
		Households	%
All	4175	4175	100.0
Land holding			
Nil	1023	1627	39.0
Up to 2.5 acres	1092	1035	24.8
2.6-5.0 acres	1112	887	21.2
5.1-10.0 acres	597	418	10.0
10.1-25.0 acres	302	178	4.3
Above 25 acres	49	30	0.7
Cultivated holding			
Nil	1166	1861	44.6
Up to 2.5 acres	1088	969	23.2
2.6-5.0 acres	1062	814	19.5
5.1-10.0 acres	563	370	8.9
10.1-25.0 acres	265	147	3.5
Above 25 acres	31	14	0.3

Table 5.2a: Percent distribution of households/farmers by size of cultivated holding, irrigated holding and drip/sprinkler irrigated holding, classified by study group.					
Landholding by type	Total	Drip/ sprinkler	Flood irri-gation	Rain-fed cultivation	Not culti-vating/ landless
Households (unweighted)	4175	932	1089	988	1166
Households (weighted)	4175	418	930	966	1861
Weighted HH distribution (%)	100.0	10.0	22.3	23.1	44.6
Mean landholding (if land >0)	4.70	7.77	4.92	3.40	3.66
Farmer category					
Marginal (<=2.5)	41.9	19.5	35.8	57.4	NA
Small (2.6-5.0)	35.2	34.0	39.0	32.0	NA
Semi-Medium (5.1-10.0)	16.0	30.1	17.1	8.8	NA
Medium (10.1-25.0)	6.4	13.9	7.7	1.8	NA
Large (25.1+)	0.6	2.6	0.4	0.0	NA
Total (%)	100.0	100.0	100.0	100.0	NA
Mean cultivated holding *	4.36	7.08	4.55	3.00	NA
Irrigated holding					
<1 acre	4.8	1.5	6.3	NA	NA
1.0-1.9	21.8	12.6	25.8	NA	NA
2.0-2.9	21.7	18.6	23.1	NA	NA
3.0-4.9	25.5	27.4	24.6	NA	NA
5.0-9.9	19.0	28.5	14.7	NA	NA
10.0+	7.3	11.4	5.4	NA	NA
Total	100.0	100.0	100.0	NA	NA
Mean irrigated holding *	3.93	5.10	3.40	NA	NA
Drip Irrigated holding					
<1 acre	2.6	2.6	NA	NA	NA
1.0-1.9	24.2	24.2	NA	NA	NA
2.0-2.9	27.9	27.9	NA	NA	NA
3.0-4.9	22.8	22.8	NA	NA	NA
5.0-9.9	18.6	18.6	NA	NA	NA
10.0+	3.9	3.9	NA	NA	NA
Total	100.0	100.0	NA	NA	NA
Mean drip irrigated holding *	3.39	3.39	NA	NA	NA
% of cultivated land irrigated	52.5	72.0	74.8	NA	NA
% of cultivated land drip irrigated	14.0	47.9	NA	NA	NA
% of irrigated land drip irrigated	26.7	66.5	NA	NA	NA
Households with cultivated holding (farmers): 55.4 %					
Cultivated holding households having irrigated holding: 58.3 %					
Cultivated holding households having drip irrigated holding: 10.0 %					
Irrigated holding households having drip irrigated holding: 31.0 %					
* Mean values are based on HHs with landholding of the specified category.					

Table 5.2b: Percent distribution of households/farmers by size of cultivated holding, irrigated holding and drip/sprinkler irrigated holding, classified by type of farmer					
Landholding (in acres)	Total	Marginal Farmer (<=2.5)	Small farmer (2.6-5.0)	Semi-Medium (5.1-10.0)	Medium/ Large (10.1+)
Cultivated holding HHs (unweighted)	3009	1088	1062	563	296
Cultivated holding HHs (weighted)	2314	969	814	370	161
Percent of households with:					
Irrigated holding among cultivated HHs	58.3	42.7	62.0	77.0	89.4
Drip irrigated holding among cultivated HHs	18.1	8.4	17.5	33.9	42.5
Drip irrigated holding among irrigated HHs	31.0	19.6	28.2	44.1	47.6
Mean size (in acres) of:					
Cultivated holding per cultivated HH	4.36	1.54	3.81	7.36	17.16
Irrigated holding per cultivated HH	2.29	0.63	1.86	4.09	10.28
Irrigated holding per irrigated HH	3.39	1.52	2.47	4.00	6.41
Drip irrigated holding per cultivated HH	0.61	0.13	0.43	1.36	2.72
Drip irrigated holding per irrigated HH	1.05	0.30	0.70	1.76	3.05
Drip irrigated holding per drip irrigated HH	3.39	1.52	2.47	4.00	6.41
Irrigated households (% distribution)					
<1 acre	4.8	12.7	1.7	1.1	0.0
1.0-1.9	21.8	47.7	15.2	6.0	1.5
2.0-2.9	21.7	39.6	18.2	10.2	5.3
3.0-4.9	25.5	0.0	52.1	24.3	8.0
5.0-9.9	19.0	0.0	12.8	52.8	28.5
10.0+	7.3	0.0	0.0	5.6	56.8
Drip Irrigated households (% distribution)					
<1 acre	2.6	6.5	3.0	1.2	0.0
1.0-1.9	24.2	54.5	26.6	13.1	3.6
2.0-2.9	27.9	39.0	27.1	22.9	25.7
3.0-4.9	22.8	0.0	35.3	25.3	19.4
5.0-9.9	18.6	0.0	8.0	35.0	32.2
10.0+	3.9	0.0	0.0	2.5	19.1

Table 5.2c: Percent distribution of households/farmers by size of cultivated holding, irrigated holding and drip irrigated holding, classified by stratum (drip density)					
Landholding (in acres)	Total	Stratum 1 (Drip >10%)	Stratum 2 (Drip 8-10%)	Stratum 3 (Drip 5-8%)	Stratum 4 (Drip <5%)
Households (unweighted)	4175	532	953	1377	1313
Households (weighted)	4175	485	952	1239	1499
Percent of households with:					
Landholding among all HHs	61.0	67.6	52.7	58.0	66.7
Cultivated holding among all HHs	55.4	61.7	47.1	50.9	62.5
Irrigated holding among cultivated HHs	58.3	68.4	45.4	51.0	66.0
Drip irrigated holding among cultivated HHs	18.1	39.2	22.7	21.2	7.0
Drip irrigated holding among irrigated HHs	31.0	57.3	50.0	41.5	10.5
Mean size (in acres) of:					
Landholding per landholding HH	4.70	3.85	4.03	5.31	4.87
Cultivated holding per cultivated HH	4.36	3.81	4.00	4.76	4.45
Irrigated holding per cultivated HH	2.29	2.39	1.57	2.13	2.71
Irrigated holding per irrigated HH	3.93	3.49	3.46	4.17	4.10
Drip irrigated holding per cultivated HH	0.61	1.20	0.67	0.86	0.23
Drip irrigated holding per irrigated HH	1.05	1.76	1.48	1.69	0.34
Drip irrigated holding per drip irrigated HH	3.39	3.07	2.97	4.06	3.26
Cultivated households (% distribution)					
Marginal (<=2.5)	41.9	49.3	40.1	42.0	40.2
Small (2.6-5.0)	35.2	29.5	41.8	32.3	35.7
Semi-Medium (5.1-10.0)	16.0	15.9	13.7	17.3	16.3
Medium (10.1-25.0)	6.4	5.2	4.2	7.3	7.1
Large (25.1+)	0.6	0.1	0.2	1.2	0.6
Irrigated households (% distribution)					
<1 acre	4.8	1.9	1.8	6.6	5.7
1.0-1.9	21.8	21.3	22.6	20.6	22.2
2.0-2.9	21.7	27.1	21.3	19.5	21.3
3.0-4.9	25.5	26.9	31.5	23.3	24.2
5.0-9.9	19.0	19.1	18.8	20.6	18.2
10.0+	7.3	3.7	4.0	9.3	8.4
Drip Irrigated households (% distribution)					
<1 acre	2.6	2.3	0.5	3.1	5.5
1.0-1.9	24.2	24.6	30.0	21.8	19.5
2.0-2.9	27.9	30.4	26.7	25.2	31.0
3.0-4.9	22.8	25.2	23.8	19.8	22.9
5.0-9.9	18.6	15.7	17.4	22.7	17.0
10.0+	3.9	1.8	1.6	7.3	4.2

Table 5.3: District-wise percent of households and mean area (in acres) of cultivated, irrigated and drip irrigated holding.

Sample districts	No. of households interviewed		Weighted number of households (HHs) having						Percent of cultivated land	
			Cultivated land		Irrigated land		Drip Irrigated land			
	Un-weighted	Weighted	Percent of HHs	* Mean holding	Percent farmers	* Mean holding	Percent farmers	* Mean holding	Irrigated	Drip irrigated
Total	4175	4175	55.4	4.36	58.3	3.93	18.1	3.39	52.5	14.0
Jalgaon	532	485	61.7	3.81	72.6	3.49	10.5	3.07	62.8	31.6
Akola	517	265	47.7	4.25	54.0	4.30	26.7	4.55	54.6	28.6
Nashik	469	541	38.7	3.58	49.1	3.78	13.4	3.02	63.1	27.9
Solapur	393	735	54.1	4.65	78.0	3.85	39.2	3.71	46.3	17.8
Wardha	467	239	44.4	5.76	52.1	6.17	33.2	5.48	31.4	9.7
Buldhana	484	411	58.1	4.36	62.4	2.96	3.5	2.87	22.2	8.8
Ahmednagar	492	743	61.3	4.62	64.0	4.40	3.7	3.16	69.6	7.2
Satara	379	382	59.1	3.46	51.2	3.72	22.4	3.10	71.3	3.3
Osmanabad	442	375	68.2	5.00	19.1	3.80	10.2	3.92	40.4	2.8

* Mean holding is per household holding land of the specified category.

Table 5.3: District-wise percent of households with and mean area (in acres) of cultivated, irrigated and drip irrigated holding.

Sample districts	No. of households interviewed		Weighted number of households (HHs) having					
			Cultivated land		Irrigated land		Drip Irrigated land	
	Un-weighted	Weighted	Percent of HHs	* Mean holding	Percent of HHs	* Mean holding	Percent of HHs	* Mean holding
Ahmednagar	492	743	61.3	4.62	44.8	4.40	6.4	3.16
Akola	517	265	47.7	4.25	25.8	4.30	12.7	4.55
Buldhana	484	411	58.1	4.36	19.0	2.96	7.8	2.87
Jalgaon	532	485	61.7	3.81	42.2	3.49	24.2	3.07
Nashik	469	541	38.7	3.58	23.1	3.78	12.9	3.02
Osmanabad	442	375	68.2	5.00	36.2	3.80	2.4	3.92
Satara	379	382	59.1	3.46	39.3	3.72	2.2	3.10
Solapur	393	735	54.1	4.65	30.2	3.85	12.1	3.71
Wardha	467	239	44.4	5.76	13.0	6.17	4.5	5.48
Total	4175	4175	55.4	4.36	32.3	3.93	10.0	3.39

* Mean holding is per household holding land of the specified category.

Table 5.4: Percent of irrigated holding by irrigation particulars, classified by type of irrigation and farmer category.

Irrigation particulars	Total	Drip/ Sprinkler irrigation	Flood irrigation	Marginal (<=2.5)	Small (2.6-5.0)	Semi-Medium (5.1-10.0)	Medium/ Large (10.1+)
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of pieces land irrigated							
1	55.7	49.2	58.1	87.4	78.5	44.5	20.5
2	26.5	33.4	23.9	12.3	17.7	40.0	29.1
3-6	17.8	17.4	18.0	0.4	3.9	15.5	50.4
Irrigated plot area							
<1.0	1.4	0.8	1.7	6.5	0.8	1.0	0.0
1.0-1.9	12.5	11.9	12.7	45.8	10.8	6.9	3.2
2.0-2.9	21.5	22.6	21.1	47.7	22.9	17.9	9.5
3.0-4.9	32.8	30.5	33.7	0.0	49.7	32.3	28.3
5.0+	31.8	34.2	30.8	0.0	15.7	42.0	59.0
Years of irrigation							
0-4	15.8	21.7	13.7	20.0	15.6	14.7	15.2
5-9	11.7	15.5	10.3	9.9	11.7	10.4	14.5
10-19	5.8	6.3	5.6	6.5	6.2	5.1	5.8
Long/20+	66.7	56.6	70.4	63.6	66.5	69.8	64.4
Type of cultivation earlier (if irrigated <10 years)							
Total (Within 10 years)	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Only partly irrigated	14.4	26.5	7.7	8.6	14.4	16.7	14.9
Rain-fed cultivation	79.5	64.6	87.6	83.3	80.6	78.7	76.7
Fallow/Uncultivable/Other	6.2	8.9	4.7	8.1	4.9	4.7	8.4
Usual source of water							
Open Well	79.5	85.2	77.4	78.7	83.1	80.3	74.0
Bore Well	12.9	11.7	13.3	11.2	10.3	11.6	19.3
Canal-Flow	3.2	0.5	4.2	6.1	2.9	3.6	1.4
River/ Stream-Flow	2.0	1.3	2.3	1.7	1.7	1.4	3.5
Lake/Watershed/Pond	0.7	0.0	0.9	0.4	0.3	1.6	0.0
Canal/River/Lake lifting	1.7	1.2	1.9	1.9	1.8	1.4	1.8
Ownership of water source							
Own	78.3	86.9	75.1	60.5	76.7	80.0	88.5
Shared	13.1	9.5	14.4	25.5	15.6	11.4	4.6
Common/Public	6.0	3.0	7.2	9.2	5.4	5.2	6.3
Purchased/Other	2.6	0.5	3.3	4.9	2.3	3.4	0.5
How water drawn to plot?							
Direct flow	4.7	1.1	6.1	7.4	4.6	5.4	2.5
Electric pump	93.1	96.1	91.9	88.9	92.2	92.9	97.0
Oil pump/Solar/Animal/etc	2.2	2.8	2.0	3.7	3.2	1.7	0.5

Table 5.5a: Manufacturer-wise share of number of installations and area under installation of drip and sprinklers.

Manufacturer	% Installations			% area Installed			% installations >2.5 acres		
	Drip	Sprin-kler	Com-bined	Drip	Sprin-kler	Com-bined	Drip	Sprin-kler	Com-bined
Total	100.0	100.0	100.0	100.0	100.0	100.0	36.4	57.0	38.8
Jain	64.0	39.8	61.1	67.1	36.7	62.5	39.1	48.6	39.8
Netafim	4.1	1.1	3.7	4.7	0.3	4.0	37.6	0.0	36.3
Sairam	4.0	0.0	3.6	3.9	0.0	3.3	51.1	NA	51.1
Drip India	2.9	0.0	2.6	2.9	0.0	2.5	29.8	NA	29.8
Kothari	2.7	1.4	2.6	1.9	1.6	1.9	10.5	91.4	15.6
Tulsi	2.6	0.7	2.4	2.9	0.7	2.6	49.9	100.0	51.6
Nirmal	2.3	0.0	2.0	1.7	0.0	1.5	3.6	NA	3.6
Phinolex	2.2	0.9	2.0	2.6	0.9	2.3	49.7	40.0	49.2
Kisan	2.1	1.7	2.0	1.9	1.6	1.9	24.1	59.8	27.5
Plastro Palcin	1.5	0.0	1.4	0.9	0.0	0.7	17.2	NA	17.2
EPC	1.0	15.1	2.6	1.2	14.8	3.2	37.7	63.4	55.0
Jaldhara	0.8	0.0	0.7	0.6	0.0	0.5	7.2	NA	7.2
Kastha	0.5	0.0	0.4	0.7	0.0	0.6	81.0	NA	81.0
Supreme	0.5	0.4	0.5	0.3	0.4	0.3	0.0	33.3	3.1
Samruddhi	0.2	0.0	0.1	0.1	0.0	0.0	0.0	NA	0.0
Hasti	0.0	11.2	1.3	0.0	15.1	2.3	100.0	70.4	70.7
Premier	0.0	3.0	0.4	0.0	2.6	0.4	NA	49.1	49.1
Dharti	0.0	0.2	0.0	0.0	0.3	0.0	NA	100.0	100.0
Other (local)	8.7	24.3	10.5	6.7	24.8	9.4	30.1	61.1	38.5
Sprinkler rent-ed/free use	0.0	0.2	0.0	0.0	0.3	0.0	NA	100.0	100.0

Table 5.5b: Percent distribution of number of installations and area installed by year of installation, classified by manufacturer of drip/sprinkler

Manufacturer	Number of installations				Area installed			
	All	2009-11	2006-08	<=2005	All	2009-11	2006-08	<=2005
Total	100.0	51.4	21.3	27.3	100.0	45.4	21.1	33.5
Jain	100.0	42.2	24.8	33.0	100.0	36.2	23.4	40.5
Netafim	100.0	76.3	21.1	2.6	100.0	65.9	31.4	2.6
Sairam	100.0	95.1	4.9	0.0	100.0	94.5	5.5	0.0
Drip India	100.0	90.4	9.6	0.0	100.0	86.8	13.2	0.0
Kothari	100.0	47.0	20.8	32.2	100.0	38.2	21.7	40.1
Tulsi	100.0	95.9	4.1	0.0	100.0	96.0	4.0	0.0
Nirmal	100.0	96.4	3.6	0.0	100.0	93.2	6.8	0.0
Phinolex	100.0	93.1	3.3	3.6	100.0	93.0	1.5	5.5
Kisan	100.0	73.8	16.9	9.4	100.0	68.9	18.1	13.0
Plastro Palcin	100.0	56.8	31.3	11.9	100.0	50.0	32.7	17.3
EPC	100.0	13.2	28.8	58.1	100.0	5.6	31.6	62.8
Jaldhara	100.0	19.9	43.2	36.9	100.0	13.9	40.2	45.9
Kastha	100.0	100.0	0.0	0.0	100.0	100.0	0.0	0.0
Supreme	100.0	60.6	39.4	0.0	100.0	53.0	47.0	0.0
Samruddhi	100.0	37.9	62.1	0.0	100.0	37.9	62.1	0.0
Hasti	100.0	47.7	14.6	37.7	100.0	34.2	19.7	46.1
Premier	100.0	31.6	5.7	62.6	100.0	33.8	7.4	58.8
Dharti	100.0	100.0	0.0	0.0	100.0	100.0	0.0	0.0
Other (local)	100.0	51.6	17.5	30.8	100.0	48.3	17.2	34.5

Table 5.6: Percent distribution of installations and mean area under installation of drip/sprinkler by year of installation, farmer category and caste class, classified by Manufacturer (Jain as against other companies)

Particulars	% of installations *			Mean area (acres) *		
	Total	Jain	Other	Total	Jain	Other
Total (unweighted)	1083	616	467	1083	616	467
Total (weighted %)	100.0	100.0	100.0	2.86	2.93	2.75
Year of Installation						
<=2005	27.2	32.9	18.2	3.52	3.60	3.28
2006-08	21.3	24.9	15.8	2.83	2.75	3.02
2009-11	51.5	42.2	66.0	2.52	2.51	2.54
Farmer category						
Marginal (<=2.5)	17.0	16.1	18.5	1.47	1.43	1.52
Small (2.6-5.0)	31.4	30.4	32.9	2.25	2.32	2.16
SemMed (5.1-10.0)	31.6	31.0	32.5	3.21	3.16	3.28
Medium/Large (10.1+)	20.0	22.4	16.1	4.45	4.51	4.32
Caste Class						
SC/ST/NT/DT	12.4	15.9	7.1	2.75	2.67	3.02
OBC/SBC	48.3	47.4	49.8	2.92	2.94	2.90
General	39.2	36.7	43.2	2.81	3.02	2.54

* Drip/sprinkler installations made in the same plot at different times are considered as different installations.

Table 5.7: Cost of drip (excluding sprinkler) and related expenses						
Drip and related expenses (Sprinkler excluded)	Total		Jain		Other	
	% who met expenses	Mean expenses per acre	% who met expenses	Mean expenses per acre	% who met expenses	Mean expenses per acre
Installed during 2006-11						
Cost of drip set	NA	21519	NA	21168	NA	21985
Cost of installation	79.8	1343	81.9	1431	77.0	1222
Subsidy on drip set	65.4	9825	70.3	9678	58.8	10056
Cost of pump set	19.6	6843	22.8	7193	15.5	6155
Installed during 2009-11						
Cost of drip set	NA	22196	NA	22180	NA	22220
Cost of installation	78.9	1373	81.1	1441	76.7	1300
Subsidy on drip set	62.7	10371	66.2	10432	59.1	10306
Cost of pump set	19.5	6827	24.4	6802	14.7	6861
Installed with subsidy (2009-11)						
Cost of drip set	NA	24137	NA	24403	NA	23858
Cost of installation	77.6	1248	80.6	1426	74.2	1033
Subsidy on drip set	100.0	10371	100.0	10432	100.0	10306
Cost of pump set	20.3	6672	24.7	6173	15.3	7615

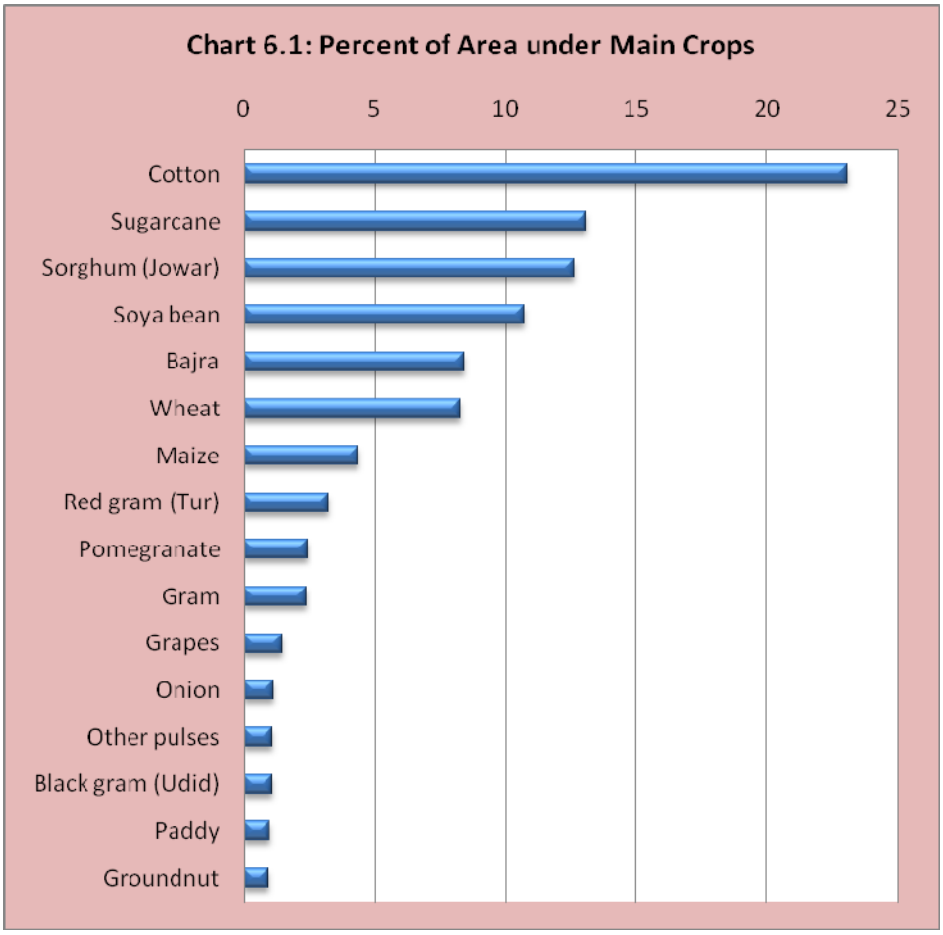
CHAPTER 6:
Cultivation

In this chapter households cultivating land are often referred to as 'farmers' and depending on the size of cultivated land possessed by them they are categorized as marginal, small, semi-medium, medium and large farmers. Further, unless otherwise specified, the kharif and rabi seasons mentioned in this chapter refer to the respective seasons during the agriculture year 2010-11 and the plantation crops refer to the same period. It is to be noted that usually the kharif season is during June to October/November and the rabi season is during November to March/April next calendar year. The households cultivating land were asked a series of questions on the crops raised by them during the agriculture year 2010-11, area under cultivation of each crop, season of the crop, type of cultivation, source of seed/sapling, expenditure on crop and the yield and its value. The data are analysed and presented in a number of sections.

6.1: Type of Crops and Area under cultivation

6.1.1: Crops and Area cultivated

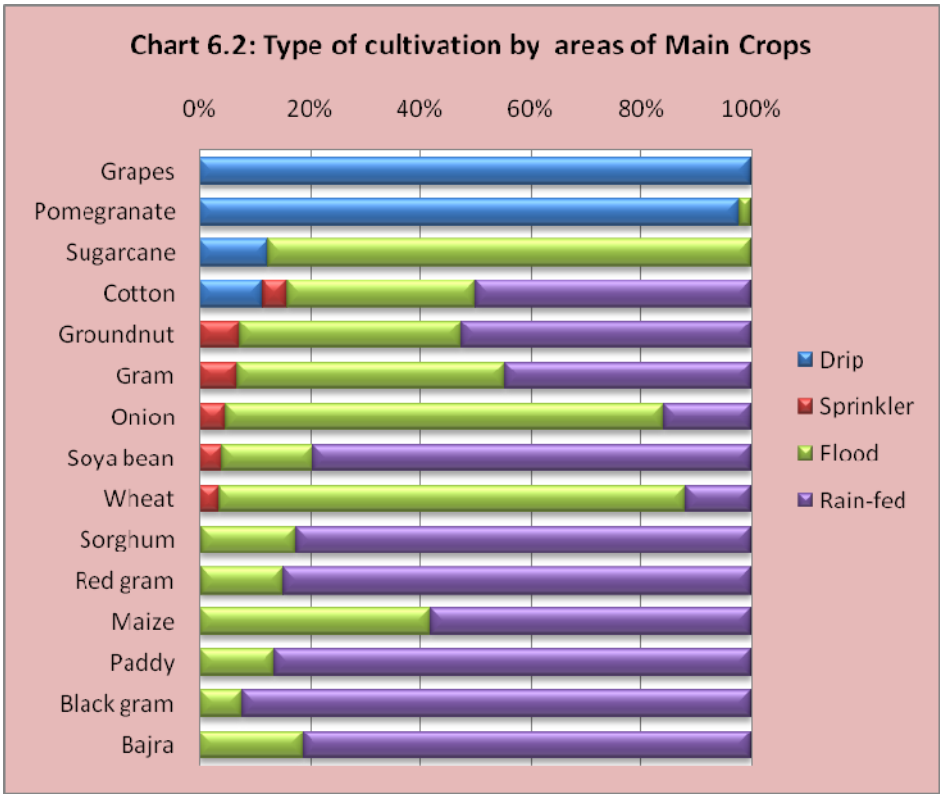
Table 6.1 gives crop-wise area under cultivation, percent of cropped area of each crop, and type of crop as main crop or mixed/intercrop. It is to be noted that in this study, in case of intercrop or mixed crop, the whole cropped area was assigned to the main crop and no area was assigned to the intercrop/mixed crop and as such the area reported for each crop is only approximate. Further, for crops that are often cultivated as intercrop the area reported is an underestimate. However it is seen from the table that only a few crops like red gram, green gram, sesame and a few other cereals are cultivated as intercrop and most other crops are cultivated as only crop or as main crop and hence except for these crops the area under cultivation may not make large differences. With this limitation, it is seen from the table that cotton was the predominant crop cultivated in as much as 23 percent of the total cropped area. The next predominant crops were sugarcane, sorghum (jowar) and soya bean, each accounted for 11 to 13 percent of the total cropped area. Two other crops namely bajra and wheat were cultivated each in more than 8 percent of the cropped area. Further a long list of crops was reportedly cultivated each in a small proportion of land area.



6.1.2: Season of Crops and Type of Cultivation

Table 6.2 gives season-wise and type of cultivation-wise area under different crops. Chart 6.2 gives type of cultivation by area under different crops. It is seen from the table that most of the crops were raised during kharif season except for wheat and gram. However, onion, ground nut to a great extent and jowar, fodder crops, select vegetables and maize to some extent were cultivated in kharif and rabi seasons. On the other hand summer crops were rarely raised by the farmers.

With regard to type of cultivation, grapes, pomegranate and banana were predominantly cultivated under drip irrigation. On the other hand sugarcane, wheat and onion were predominantly cultivated under flood irrigation. At the same time green gram (mung), black gram (urdid), paddy, red gram (tur), sorghum (jowar), bajra and soya bean were cultivated predominantly under rain-fed cultivation. With respect to cotton, nearly 50 percent of the area was rain-fed, 34 percent of area was under flood irrigation and just 12 percent of area was under drip irrigation. As far as sugarcane is concerned, it was 88 percent of the sugarcane area was under flood irrigated and just 12 percent of the area was under drip irrigation.



6.1.3: Type of farming and Source of seed/sapling

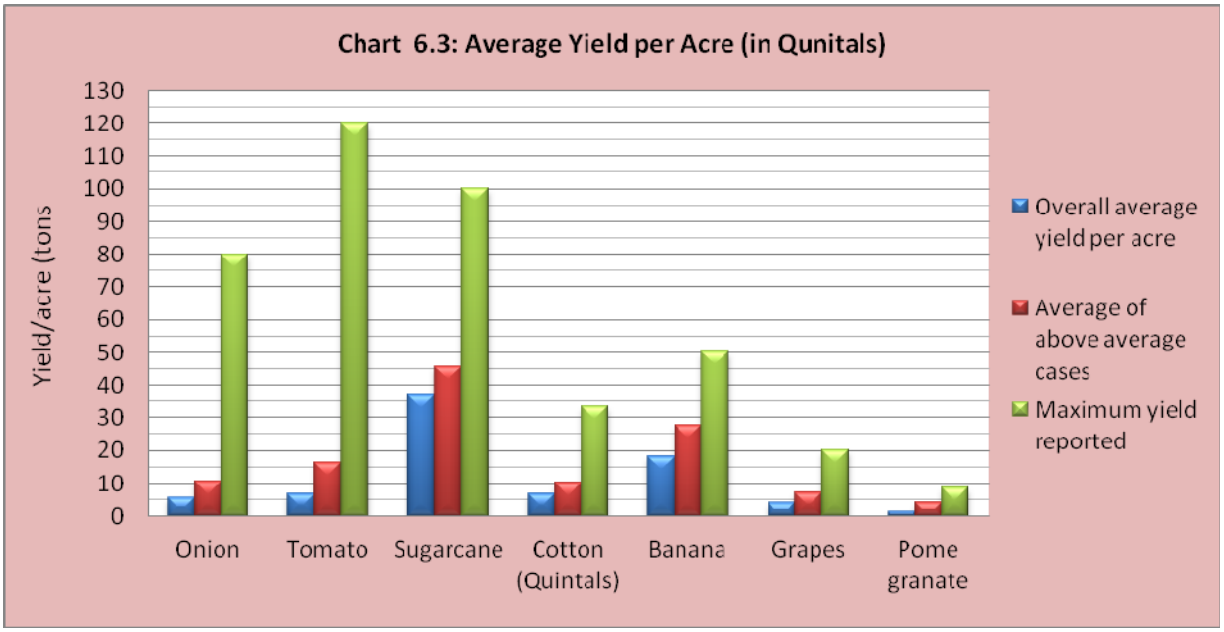
Table 6.3 gives crop-wise cropped area under only one crop, that were under own farming, and the source of seed/sapling. It is seen from the table that most of the cropped area were under only one crop and also under own farming. With regard to seed/sapling, it was from different sources. Specifically the seeds/sapling/stem of spices, sugarcane, pulses, cereals were from their own farm or obtained from others farm. Only banana plantlets were obtained from Jain and that too in respect of 25 percent of the banana crops only. At the same time it is to be noted that the banana crop dominated north-eastern part of Jalgaon district that did not represent the sample. It is said that a large quantity of Jain produced tissue culture banana plantlets were supplied to this region. Otherwise much of the seeds were obtained from open market or from outlets like APMC and Agro-rentres.

6.2: Crop Yield and Expenses

As far as crop yield is concerned, it is often depended on the type of cultivation, type of seed/sapling used, appropriate fertilizer application, and other good agricultural practices besides timely application of water in adequate quantity. However as we see in the next chapter many farmers did not follow appropriate agricultural practices and as such the reported crop

yield was often much less than the expected yield. In addition there is a tendency of the farmers under reporting the quantity of yield. But we do not have any estimate of what proportions of farmers tend to under-report the yield and to what extent. As such the yields reported in this report are subjected to these limitations. However, in this report we have considered the yield in three ways; the yield reported by all farmers, the yield reported that are higher than the overall average and the maximum yield reported. It is to be noted that in some places some crops grown during the year 2010-11 were not yet harvested when the survey was conducted (especially sugarcane and banana) and hence the analysis on yield and expenses are made only for the crops that were already harvested and reported in the survey. The crops completely failed (no yield) are also excluded from this analysis, though the number of such cases was very less.

6.2.1: Crop Yield



The yield data are tabulated and presented in tables 6.4a and 6.4b. Chart 6.3 gives the figures for selected crops. It is seen from the tables and chart that the overall average yield per acre for cotton was 6.7 quintals and it was just 4.9 quintal under rain-fed cultivation, 6.9 quintals under flood irrigation and 10.7 quintals under drip irrigation. However the maximum yield reported was as high as 33.3 quintals per acre and was under drip irrigation. Similarly for sugarcane the overall average yield per acre was 36.8 tons and it was 36.2 tons under flood irrigation and 41.0 tons under drip irrigation. At the same time the maximum yield reported was 90 tons under flood irrigation and 100 tons under drip irrigation. Similar was the case in respect of most of the crops. The data indicate that the expected maximum yield was attained by only a few farmers but otherwise many farmers harvested much lesser than the expected yield, resulting in a rela-

tively low overall average yield. Though we have not investigated the agricultural practices followed by the farmers, it appears that lack of water or timely rain and poor agricultural practices followed by the farmers, were the major causes for the low crop yield reported by many farmers. For instance, as we see in the next chapter, hardly 47 percent of the farmers reportedly injected fertilizer through drip and only an equal proportion injected chemicals through drip to clean up dripper to ensure regular and smooth flow of water.

6.2.2: Expenses on raising crops

Table 6.5 gives average expenses per acre on raising selected crops by type of cultivation. The expenses included hiring and maintenance of equipments, seed/sapling, fertilizer/manure, pesticide, water and electricity charges, paid labour and others. It is to be noted that in the questionnaire each such expenses was assessed individually and for each crop, and recorded.

The expenses vary widely by crop and by type of cultivation. Overall the average expense per acre was higher for drip irrigated crops and lower for rain-fed cultivated crops. It appears that grapes and banana crops (under drip irrigation) incurred the highest expenditure of about Rs. 35,000 per acre, followed by vegetables, sugarcane, tomato and pomegranate each Rs. 20,000 per acre. It is to be noted that most of these crops were raised under drip or flood irrigation. On the other hand most of the food crops incurred lesser expenditure ranging from Rs. 3,000 to Rs. 6,000 but often these crops were raised under rain-fed cultivation only. With respect to cotton the expenses were Rs. 13,400 under drip irrigation, around Rs 10,000 under sprinkler or flood irrigation and Rs. 7,600 under rain-fed cultivation.

6.2.3: Value of Yield and Net Income

Table 6.6a gives the average price/value of yield per acre as reported by the farmers and table 6.6b gives the net income from the crops. It is to be noted that the price/value of the yield includes the main-produce and the by-product as applicable. Further the value was assessed based on the price prevailing at harvest. The harvested produce that was not sold until the survey and that was kept for household use were also assessed for their value, and included.

It is seen from the tables that the average value of the yield was the highest for banana amounting to more than a lakh (Rs. 1,02,300) rupees per acre. Further, as we have already seen, though the expenses were the highest for banana crops, its net income was the highest of all crops. The net income from banana crop per acre (value minus expenses) worked out to Rs. 69,300. The next crop with very high net income was sugarcane (Rs. 43,800 per acre). The other crops with a net income of Rs. 10,000 to Rs. 20,000 were fruits and nuts, tomato, cotton, pomegranate, onion, grapes, vegetables/spices and groundnut (in order, high to low income). On the other hand the net income of most of the food crops was Rs. 3,000 to Rs. 5,000 per acre only.

Table 6.1: Number of weighted instances (cases) of crops recorded, total area under different crops, percent of area under different crops, percent distribution of cases and area of each crop by crop mix

Crop	Total cases	Total area (acres)	% of cropped area	% distribution of cases		
				Only crop	Main crop	Inter/ mixed
Cotton	1055.4	2590.1	23.1	78.3	21.7	0.0
Sugarcane	592.3	1470.8	13.1	99.5	0.5	0.0
Sorghum (jowar)	806.8	1416.6	12.6	94.2	5.1	0.7
Soya bean	514.1	1205.5	10.7	84.0	15.2	0.8
Bajra	604.0	943.9	8.4	94.1	5.0	1.0
Wheat	585.2	932.3	8.3	100.0	0.0	0.0
Maize	275.2	488.6	4.3	95.9	2.9	1.2
Red gram (Tur)	483.5	363.2	3.2	38.5	1.8	59.7
Pomegranate	102.4	270.4	2.4	100.0	0.0	0.0
Gram	164.6	263.4	2.3	95.0	0.0	5.0
Grapes	55.7	165.5	1.5	100.0	0.0	0.0
Onion	124.6	129.0	1.1	94.3	0.7	5.0
Other pulses	76.6	123.3	1.1	79.7	2.1	18.2
Black gram (Udid)	116.4	122.0	1.1	75.4	9.3	15.2
Paddy	92.3	108.8	1.0	100.0	0.0	0.0
Groundnut	120.7	106.8	1.0	94.6	2.1	3.3
Fodder crops	107.6	104.8	0.9	99.8	0.0	0.2
Tomato	73.9	81.1	0.7	95.3	3.2	1.5
Green gram (Mung)	96.1	78.6	0.7	64.8	2.3	32.8
Other vegetables.	55.7	54.2	0.5	92.1	0.0	7.9
Banana	19.0	33.9	0.3	100.0	0.0	0.0
Orange (all types)	8.2	21.8	0.2	100.0	0.0	0.0
Sunflower	12.9	18.5	0.2	97.6	2.4	0.0
Other cereals	21.0	18.4	0.2	58.1	17.0	24.9
Sesame	12.5	11.6	0.1	73.1	0.0	26.9
Mango	11.8	10.2	0.1	100.0	0.0	0.0
Other spices	4.4	8.3	0.1	100.0	0.0	0.0
Brinjal	12.5	7.6	0.1	96.3	3.1	0.6
Ladyfinger (Bhendi)	11.6	7.0	0.1	98.3	0.0	1.7
Citrus (Mosambi)	3.0	7.0	0.1	100.0	0.0	0.0
Custard apple	3.4	6.7	0.1	100.0	0.0	0.0

Crops cultivated in less than 0.1 percent of the total cropped area: Safflower, Sapota (Chikoo), Chilies, Cabbage, Guava, Lemon, Watermelon, Cauliflower, Musk melon (Kharbuj), Potato, Flowers (all types), Cucumber, Mixed vegetables, Papaya, Coconut, Ginger, Garlic, Betel leaves, Radish, Turmeric, Fenugreek (Methi), Strawberry, Ragi, Horse gram (Kulith), Mustard, Carrot, Coriander, Drum stick, Niger seed, Pea (Watana)

Table 6.2: Crop-wise percent of cropped area by season of crop and type of cultivation, during agriculture year 2010-11, by crop

Crop name/group	Percent of cropped area by:						
	Season of crop			Type of cultivation			
	Kharif	Rabi	Summer	Rain-fed	Flood	Drip	Sprinkler
Grapes	100.0	0.0	0.0	0.0	0.0	100.0	0.0
Pomegranate	100.0	0.0	0.0	0.0	2.1	97.9	0.0
Banana	100.0	0.0	0.0	0.0	17.4	82.6	0.0
Other fruits and nuts	90.3	5.3	4.3	3.2	39.0	53.1	4.7
Other vegetables	64.4	30.5	5.0	7.1	51.9	38.8	2.2
Tomato	78.0	16.4	5.6	16.0	63.7	19.9	0.5
Sugarcane	99.8	0.2	0.0	0.0	87.5	12.6	0.0
Cotton	99.9	0.1	0.0	49.9	34.2	11.5	4.4
Spices	88.6	11.0	0.3	58.3	24.2	8.1	9.4
Fodder,Flower	77.6	22.4	0.0	34.1	64.6	0.7	0.8
Wheat	0.0	100.0	0.0	11.7	84.7	0.0	3.6
Onion	34.5	60.9	4.6	15.9	79.1	0.0	5.0
Gram	2.1	98.0	0.0	44.5	48.6	0.0	6.9
Maize	84.3	15.6	0.1	58.2	41.6	0.0	0.3
Groundnut	54.4	42.3	3.4	52.4	40.3	0.0	7.3
Other oilseeds	77.0	23.0	0.0	74.5	25.0	0.0	0.5
Bajra	95.3	4.7	0.0	81.2	18.8	0.0	0.0
Sorghum (Jowar)	76.3	23.7	0.0	82.4	17.2	0.0	0.3
Soya bean	97.6	2.3	0.0	79.2	16.6	0.0	4.2
Red gram (Tur)	100.0	0.0	0.0	84.6	15.1	0.0	0.3
Paddy	100.0	0.0	0.0	86.4	13.5	0.0	0.2
Black gram (Udid)	99.2	0.7	0.0	92.1	7.8	0.0	0.1
Green gram (Mung)	99.7	0.2	0.0	94.3	5.0	0.0	0.6
Other cereals	98.0	1.9	0.0	98.0	1.9	0.0	0.0
Other pulses	98.7	1.3	0.0	99.4	0.6	0.0	0.0

Table 6.3: Crop-wise percent of cropped area as 'only crop', as 'own farming' and percent of area cultivated with seed/sapling from different agencies, during 2010-11.

Crop name	% cropped area		% area with seed/sapling from			
	Only crop	Own farming	Own/ Other farm	Open market	Jain	APMC/ Agro-center, etc
Bajra	93.5	98.6	17.5	40.1	0.0	42.3
Maize	97.1	98.4	3.4	51.8	0.0	44.8
Paddy	100.0	99.3	31.9	50.6	0.0	17.4
Sorghum (Jowar)	92.3	97.6	26.9	39.7	0.0	33.4
Wheat	100.0	96.6	8.2	42.3	0.0	49.5
Other cereals	79.2	91.4	79.8	20.2	0.0	0.0
Gram	100.0	97.8	30.7	30.7	0.0	38.6
Black gram (Udid)	81.9	98.5	18.0	35.7	0.0	46.3
Green gram (Mung)	91.4	98.7	36.3	32.2	0.0	31.5
Red gram (Tur)	92.9	97.6	14.7	48.3	0.0	37.0
Other pulses	92.2	100.0	63.3	25.0	0.0	11.7
Groundnut	98.4	95.4	24.7	45.5	0.0	29.8
Soya bean	80.9	98.6	2.7	39.9	0.0	57.5
Other oilseeds	99.7	98.4	3.1	40.1	0.0	56.8
Onion	98.6	97.7	27.8	37.1	0.5	34.6
Tomato	96.8	97.5	2.0	61.2	0.0	36.8
Other vegetables	99.5	99.1	3.5	66.5	0.0	30.1
Spices	98.3	69.5	65.3	21.3	0.0	13.5
Sugarcane	99.9	98.2	89.7	6.7	0.0	3.6
Cotton	74.3	97.4	0.3	31.0	0.0	68.7
Fodder. Flower	100.0	99.4	50.8	26.5	0.0	22.7
Banana	100.0	100.0	44.7	19.4	25.0	10.9
Grapes	100.0	100.0	30.8	67.4	0.0	1.9
Pomegranate	100.0	100.0	28.9	27.7	4.0	39.4
Other fruits and nuts	100.0	100.0	28.6	13.8	0.0	57.6

* 'Main crop' of mixed/inter crop is 100 minus 'only crop';
** Share cropping is 100 minus 'Own farming'

Table 6.4a: Average yield per acre for select crops by type of cultivation (if reported yield was >0)					
Crop	Yield (quintals)/acre (for cases with yield>0)				
	Total	Drip	Sprinkler	Flood	Rain-fed
Bajra	4.7	-	-	7.2	4.1
Maize	9.8	-	8.6	10.2	9.6
Paddy	6.8	-	5.0	8.6	6.5
Sorghum (Jowar)	3.9	-	3.7	3.9	3.9
Wheat	8.2	-	8.8	8.5	5.7
Gram	2.9	-	6.6	2.9	2.3
Black gram (Udid)	2.0	-	2.0	2.1	2.0
Green gram (Mung)	2.1	-	2.7	3.6	2.0
Red gram (Tur)	2.6	-	4.2	3.5	2.4
Groundnut	6.0	-	5.5	6.7	5.6
Soya bean	5.8	-	7.0	7.7	5.3
Onion	55.5	-	62.2	60.2	30.1
Tomato	68.3	98.5	25.0	70.2	24.1
Vegetables/spices	41.3	49.1	20.2	41.0	16.6
Sugarcane	368.3	410.8	-	362.1	-
Cotton	6.7	10.7	7.9	7.9	4.9
Banana	180.5	172.1	-	218.3	-
Grapes	39.7	39.7	-	-	-
Pomegranate	15.2	13.5	-	85.7	-
Other fruits and nuts	35.9	42.8	30.0	31.0	6.0

Table 6.4b: Average yield per acre for select crops by type of cultivation (if reported yield was > overall average yield)					
Crop	Yield (quintals)/acre (for cases with yield>mean)				
	Total	Drip	Sprinkler	Flood	Rain-fed
Bajra	8.3	-	-	8.6	8.2
Maize	15.7	-	14.2	16.6	15.1
Paddy	10.5	-	-	10.8	10.4
Sorghum (Jowar)	7.2	-	7.8	6.4	7.3
Wheat	12.2	-	11.4	12.3	10.6
Gram	4.8	-	6.6	4.6	4.3
Black gram (Udid)	3.4	-	2.0	2.7	3.5
Green gram (Mung)	4.1	-	2.8	9.1	3.9
Red gram (Tur)	4.5	-	4.5	4.2	4.6
Groundnut	11.1	-	9.7	10.1	13.0
Soya bean	8.4	-	8.2	9.8	7.9
Onion	104.5	-	110.3	104.5	100.8
Tomato	162.7	188.8	-	152.3	171.1
Vegetables/spices	-	-	-	-	-
Sugarcane	455.5	487.5	-	449.7	-
Cotton	10.0	11.5	9.5	9.7	9.2
Banana	278.8	284.5	-	260.0	-
Grapes	72.8	72.8	-	-	-
Pomegranate	42.5	38.3	-	85.7	-
Maximum yield *					
Onion	800.0	-	153.3	800.0	140.0
Tomato	1,200.0	1,200.0	25.0	625.0	294.0
Sugarcane	1,000.0	1,000.0	-	900.0	-
Cotton	33.3	33.3	16.0	26.7	24.0
Banana	500.0	500.0	-	285.7	-
Grapes	200.0	200.0	-	-	-
Pomegranate	85.7	85.7	-	80.0	-
* Maximum yield reported by any former in the sample					

Table 6.5: Average Expenses per acre for select crops by type of cultivation (if reported yield was >0)

Crop	Expenses (Rs)/acre (all cases with yield>0)				
	Total	Drip	Sprinkler	Flood	Rain-fed
Grapes	36,452	36,452	-	-	-
Banana	33,000	36,038	-	19,015	-
Vegetables/spices	25,936	35,110	23,419	20,023	20,910
Tomato	23,392	27,619	45,500	24,116	14,494
Sugarcane	19,491	20,807	-	19,300	-
Pomegranate	18,276	17,631	-	45,429	-
Onion	14,981	-	16,332	16,362	7,593
Other fruits and nuts	11,662	12,697	22,325	10,945	-
Cotton	9,542	13,352	10,244	10,982	7,605
Wheat	6,751	-	6,220	7,058	4,713
Groundnut	6,657	-	7,999	7,218	6,011
Paddy	5,810	-	4,750	10,638	5,090
Maize	5,220	-	5,160	5,943	4,676
Soya bean	5,169	-	6,513	6,952	4,727
Green gram (Mung)	4,327	-	5,942	5,948	4,226
Red gram (Tur)	3,986	-	5,836	5,593	3,627
Gram	3,974	-	5,730	4,384	3,291
Bajra	3,445	-	-	5,163	3,046
Sorghum (Jowar)	3,411	-	7,164	4,359	3,186
Black gram (Udid)	3,192	-	3,800	5,876	2,922

Table 6.6a: Average value of yield per acre for select crops by type of cultivation (if reported yield was >0)					
Crop	Value of crop (Rs)/acre (all cases with yield>0)				
	Total	Drip	Sprinkler	Flood	Rain-fed
Banana	102,287	102,481	-	101,239	-
Sugarcane	63,296	68,448	-	62,548	-
Grapes	51,339	51,339	-	-	-
Tomato	43,220	64,502	20,000	42,458	20,447
Vegetables/spices	39,895	45,358	61,984	37,793	18,363
Pomegranate	35,636	33,091	-	142,857	-
Other fruits and nuts	32,339	38,757	24,000	28,243	3,000
Onion	31,323	-	33,065	33,914	17,732
Cotton	27,970	44,356	33,004	33,125	20,177
Groundnut	17,545	-	17,548	20,512	15,199
Wheat	11,730	-	11,312	12,235	8,245
Soya bean	11,228	-	14,184	13,348	10,628
Maize	10,294	-	13,407	11,017	9,734
Paddy	9,702	-	7,500	11,224	9,482
Red gram (Tur)	8,785	-	14,265	10,896	8,298
Sorghum (Jowar)	8,200	-	12,412	10,619	7,650
Green gram (Mung)	7,003	-	8,005	12,142	6,711
Gram	6,777	-	15,019	6,648	5,655
Black gram (Udid)	6,496	-	4,000	7,323	6,416
Bajra	5,421	-	-	7,670	4,898

Table 6.6b: Average net income per acre for select crops by type of cultivation (if reported yield was >0)					
Crop	Net income (Rs)/acre (all cases with yield>0)				
	Total	Drip	Sprinkler	Flood	Rain-fed
Banana	69,287	66,443	-	82,224	-
Sugarcane	43,805	47,641	-	43,248	-
Other fruits and nuts	20,677	26,060	1,675	17,299	3,000
Tomato	19,828	36,883	-	18,342	5,954
Cotton	18,428	31,004	22,760	22,143	12,572
Pomegranate	17,360	15,459	-	97,429	-
Onion	16,342	-	16,732	17,551	10,139
Grapes	14,887	14,887	-	-	-
Vegetables/spices	13,959	10,248	38,565	17,770	-
Groundnut	10,888	-	9,549	13,294	9,188
Soya bean	6,058	-	7,671	6,396	5,902
Maize	5,074	-	8,247	5,074	5,058
Wheat	4,980	-	5,092	5,177	3,532
Red gram (Tur)	4,798	-	8,430	5,304	4,672
Sorghum (Jowar)	4,789	-	5,249	6,261	4,463
Paddy	3,892	-	2,750	586	4,392
Black gram (Udid)	3,305	-	200	1,447	3,494
Gram	2,803	-	9,289	2,264	2,364
Green gram (Mung)	2,676	-	2,064	6,193	2,485
Bajra	1,975	-	-	2,506	1,852

CHAPTER 7:
Drip/Sprinkler Experiences

A series of questions were asked to the drip/sprinkler farmers as to how the latest supplier of drip/sprinkler was chosen, and if the latest installation was made at least one year ago, then they were asked about maintenance contract made, training in assembling, dismantling and maintenance of drip set, loss/damages experienced, their practice of injecting fertilizer and chemicals through drip, reduction in labour and increase in yield, were ascertained. In respect of farmers who had not installed drip were asked of their knowledge about drip, if had knowledge then their version of merits and demerits of drip, reasons for not installing drip, and their intension to install drip in the near future were ascertained. With respect to all farmers having sons, they were asked about their intension to keep their sons in agriculture and the sons' intension to remain in agriculture were ascertained. This chapter discusses all these issues from the perspective of the farmers.

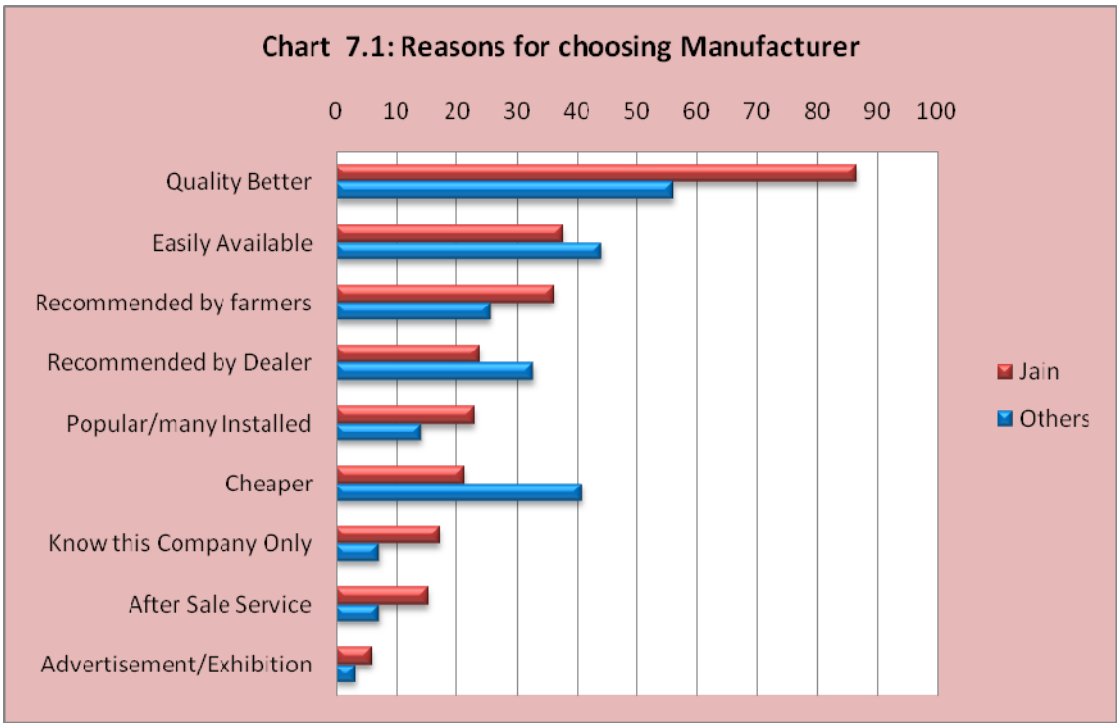
7.1: Drip Experiences

7.1.1: Choice of Drip Set

Table 7.1 gives details of number and names of manufacturers/suppliers of the currently installed drip sets by size of drip holding. Generally farmers had installed drip set of only one brand. Only about 5 percent of the farmers had installed drip set manufactured by more than one company, that too by farmers whose drip irrigated holding was 2 acres or more. The latest installed drip supplier was Jain in case of 61 percent of the cases and in respect of others it was a variety of companies. Among those who installed drip sets at different times and from two or more companies, the previous company was Jain in respect of 44 percent of the cases and 'others' in respect of the remaining 56 percent of the cases. Though the number of farmers switching company was very small (23 cases) it indicates that switching from Jain to other companies (44 percent) was substantial, which the Jain company may take note of it.

For the question "Why did you choose the drip/sprinkler set from (NAME) company?" they gave a number of reasons and are tabulated and given in table 7.2. As many as 87 percent of the farmers who installed Jain drip sets reported that the quality of Jain drip set was better, as against 56 percent of farmers reported the same in respect of other drip sets. On the other

hand 41 percent of 'other' drip farmers as compared to 20 percent of Jain drip farmers expressed that the drip sets were cheaper and hence they installed it. The other factors that were more in favour of Jain drip sets were: recommended by other farmers, popular in the area and after sale service.



7.1.2: After-sale Services

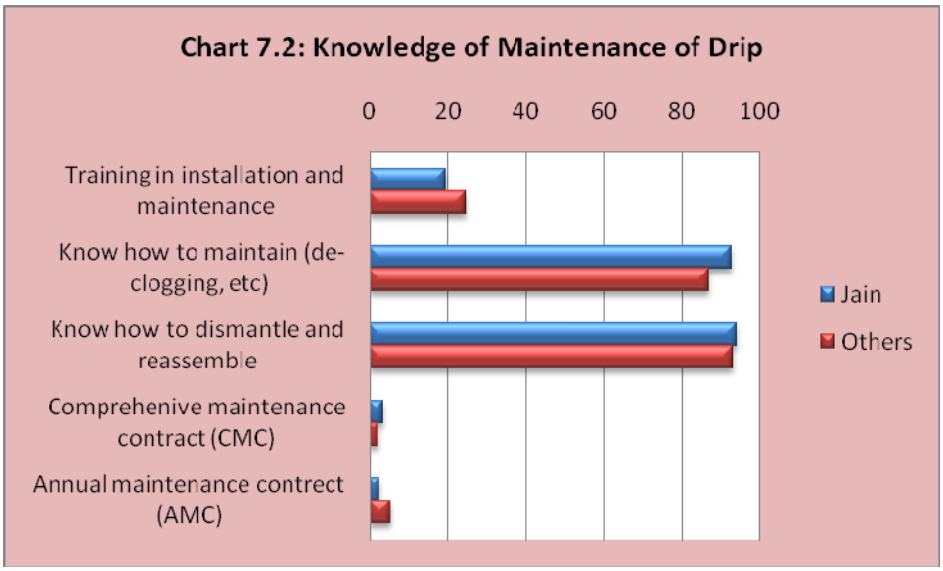


Table 7.3 and chart 7.2 give training, knowledge of dismantling and reassembling, and annual maintenance contract made with dealers/companies by size of drip irrigated holding and manu-

facturer of drip sets. It is seen from the table that only around 20 percent of the farmers received any type of training or orientation in the maintenance of the drip sets, and the proportion was lesser for Jain drip sets as compared to other drip sets. However more than 90 percent of the customers of any drip company expressed that they knew how to maintain (especially de-clogging) the drip set and also dismantling and reassembling the drip set. According to the farmers any kind of annual maintenance contract was not in practice.

7.1.3: Injecting Fertilizer and Chemicals

Table 7.4 gives percent of drip irrigating farmers injecting fertilizer through drip set and percent injecting chemical to clean the drippers for the smooth flow of drip water. Presented also in this table is about their opinion on adequate pressure of the pump and loss or damage of drip set. It is seen from the table that as many as 50 percent of the Jain drip set holders and 58 percent of other drip farmers were reportedly not injecting fertilizer through drip set. Those who reported injecting fertilizer were doing at different intervals ranging from less than a week to monthly or rarely and the pattern did not differ much between Jain and other customers.

Regarding injecting chemicals through drip set to clean the drippers to improve dripping of water, the situation was almost the same. That is, nearly 50 percent of Jain customers and 62 percent of other customers reported that they were not injecting chemicals through drip set. Majority of those who reported injecting chemicals did so monthly or rarely only. However almost all drip irrigating farmers reported that their pump set was giving adequate pressure, meaning that dripping was uniform across the lines.

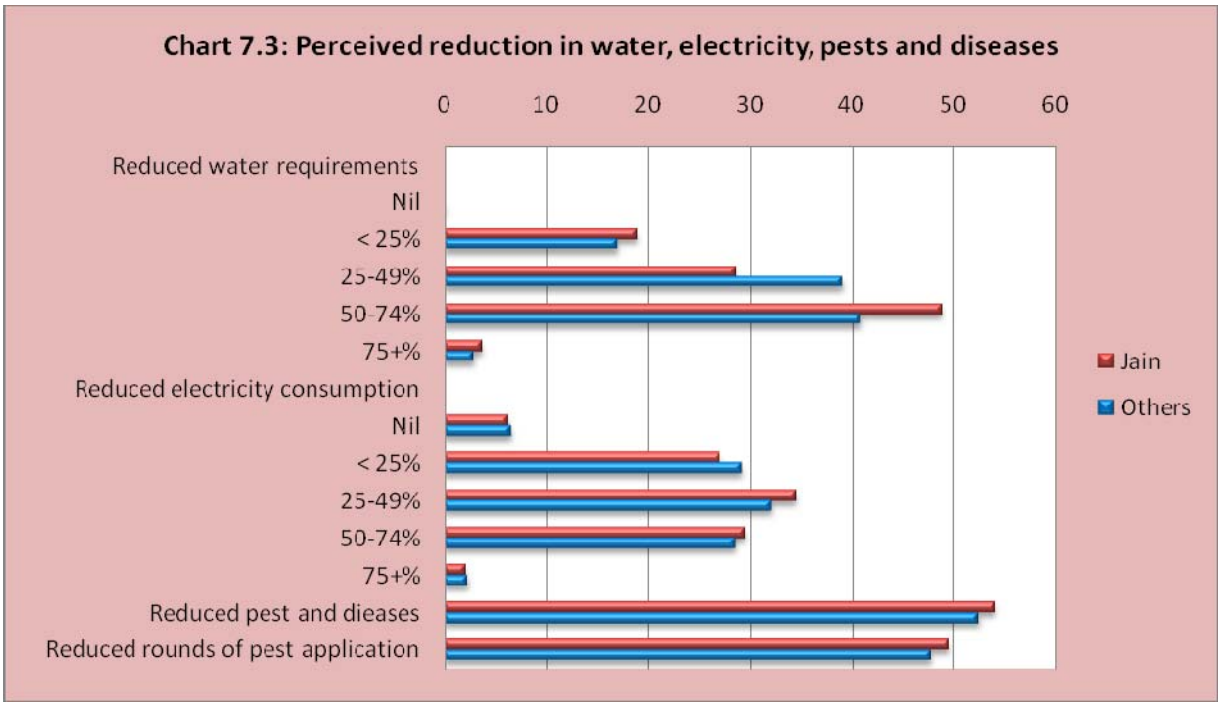
With respect to experience of loss and/or damage of drip sets, mainly tubes, as many as 38 percent of the drip irrigating farmers reported of damage due to rats and squirrels. Further one-fifth of the farmers also reported cracks and/or bursts in the drip sets. Other kinds of damages such as theft, fire, accidental damage were rarely reported.

7.2: Reduction in Water, Power and Labour

7.2.1: Perceived Reduction in Water and Power

Table 7.5 gives perceived reduction in water and electricity requirements, reduction in pest and diseases, and reduction in pest applications due to drip irrigation, classified by manufacturer of drip set. All drip irrigating farmers felt that the water requirements had come down due to drip irrigation but the reported extent of reduction varied and it did not differ between Jain and other customers. However, as many as 50 percent of the farmers reported that the water requirements reduced by more than 50 percent, and according to another one-third of the farmers the reduction was in the range of 25-49 percent. So it is clear that installation of drip sets

greatly reduced the water requirements of the farmers, which was otherwise a major problem for many farmers. It also shows that optimum usage of water can be made and more area can be uniformly irrigated with drip sets.

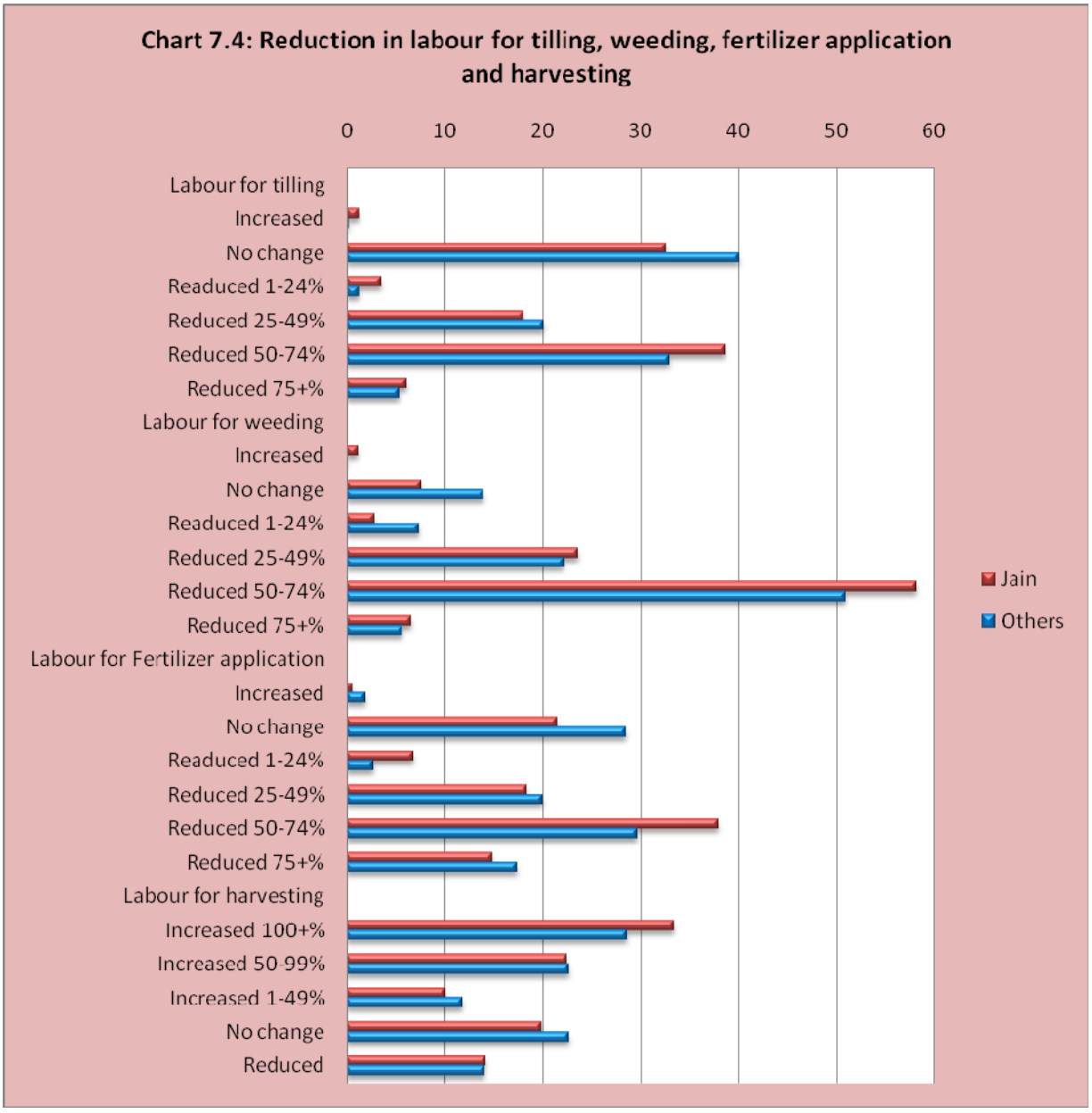


Needless to say that with the reduction in water requirements the electricity consumption also reduces because most farmers lift water using electric pumps. However the extent of reduction in electricity consumption reported was not to the extent of the reduction reported in water requirements. It may be due to the fact that the pump set need to exert pressure on the drip set for uniform flow of water and it amounts to some amount of extra power consumption. It is to be noted that it does not automatically mean that it was the saving for the farmers because the electricity board charged uniformly minimum rates irrespective of the amount of electricity consumed. But it is a saving for the electricity board and to the nation because the electricity not consumed is the electricity saved.

With respect to pest and diseases, more than 50 percent of the drip irrigating farmers admitted that there was a reduction in pest and diseases and almost the same proportion agreed that there was reduction in the number of rounds of pest application in the field due to the adoption of drip irrigation.

7.2.1: Perceived Reduction in Labour

Table 7.6 and chart 7.4 give reported reduction in labour for tilling, weeding, fertilizer application and increase in labour for harvesting due to drip irrigation by manufacturer of drip set.

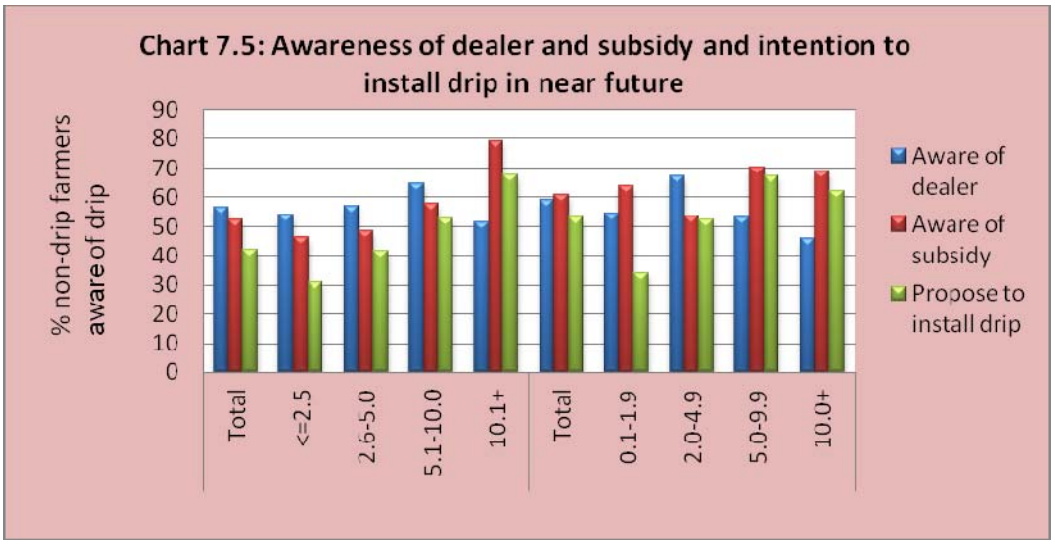


With respect to labour for tilling, one-third of the Jain drip farmers and two-fifths of the other drip farmers felt there that was no change in the labour for tilling but at the same time more than 40 percent of the farmers felt that there was more than 50 percent reduction in labour for tilling. At the same time almost all farmers reported a reduction in labour requirement for weeding and the reduction was higher than the reduction in the labour for tilling. With respect to the labour for fertilizer application, around one fifth of the farmers reported that there was no reduction in the labour for fertilizer application and most others reported a reduction of 25 percent to 75 percent reduction in labour for fertilizer application. At the same time a large ma-

jority of farmers reported an increase in labour for harvesting mainly due to the increase in yield.

7.3: Awareness about Drip by Non-drip farmers

The non-drip farmers were asked a question as to whether they were aware of drip irrigation and if they said 'yes' then they were probed as to whether they had some knowledge about it. Those who had some knowledge of drip irrigation were asked about the benefits/advantages and disadvantages of drip irrigation, awareness about a dealer nearby, awareness about subsidy, intention to install drip in the near future, and if had no intension then the reason for that. The data are analysed and presented in table 7.7.



It is seen from the table that more than 80 percent of the non-drip farmers reported that they were not aware or had no knowledge of drip irrigation and it did not differ by size of cultivated holding and size of irrigated holding. Further among the farmers hardly anybody had received any training or orientation in drip irrigation.

The benefits and advantages of drip irrigation as perceived by non-drip irrigating farmers who had knowledge of drip irrigation were that drip irrigation saves water, saves electricity, gives higher yield, besides many other reasons. At the same time the disadvantages mentioned were a few and that too by a few respondents only. The disadvantages mentioned were high cost and crack/bust in the drip set, among others.

Among the target farmers (non-drip irrigating farmers who had knowledge of drip irrigation), only a little more than 50 percent were aware of a dealer nearby and almost an equal propor-

tion were aware of subsidy available for installing drip set. Further among the target farmers more than 40 percent showed intention to install drip set in the near future and the proportion having favourable intention increased from 30 percent among marginal farmers to more than 60 percent among medium/large farmers. The reasons for not proposing to install drip set in the near future was mainly non-availability of water source by non-irrigated holing farmers and high cost or no money to install drip by both non-irrigated and irrigated holding farmers. A significant proportion of marginal and small farmers also felt that their landholding was not large enough to install drip set.

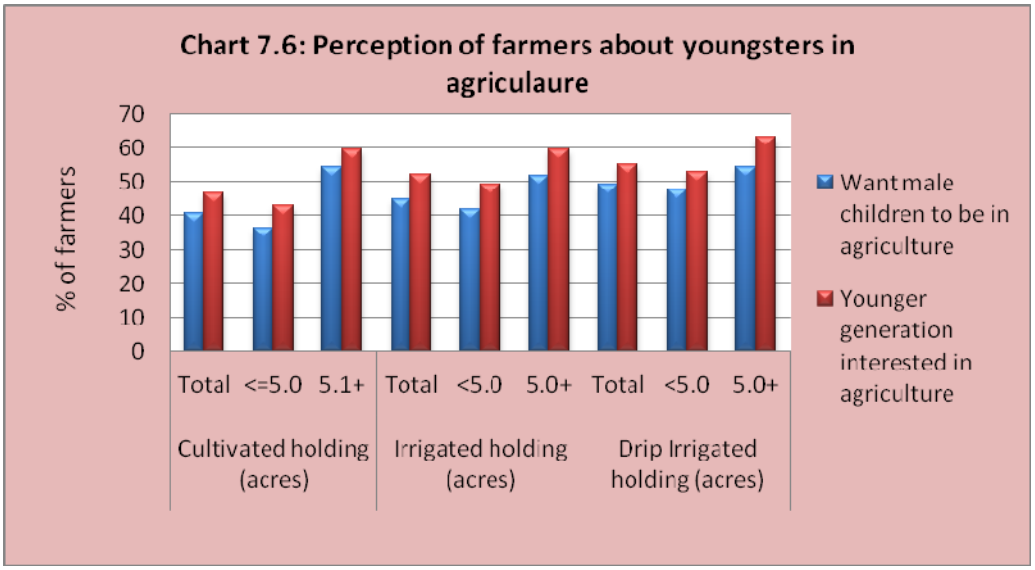
7.3: Perception about Younger Generation

The farmers with younger generation (age below 30) sons were asked the question “Do you want them to take up agriculture as his/their profession?” If yes, “Why do you want them to be in agriculture?” and if no “Why did you NOT like him/them to be in agriculture?” Further, in respect of all farmers, a question was asked “Do you think the younger generation is interested in taking up agriculture as their profession?”, if yes “How do you say so?” and if no “Why not shown interest?” The data are processed and presented in table 7.8.

7.3.1: Want children to be in Agriculture?

Among the farmers two-thirds expressed that they wanted their sons to take up agriculture as their profession. The proportion of farmers who wanted their sons to take up agriculture as their profession slightly increased as the size of landholding increased. However, even among farmers with more than 5 acres of drip irrigated holding, not more than 50 percent of them wanted their sons to take up agriculture as their profession.

The major reasons for farmers who wanted their children to take up agriculture as their profession were that agriculture was their traditional or family occupation and agriculture was profitable with drip irrigation. On the other hand, the major reasons for formers who did want their children to take up agriculture as their profession were that agriculture was not profitable, frequent drought/crop failures and agriculture requires hard and untimely work. A substantial proportion of farmers also felt that they wanted their children to learn new skills or modern work, and also felt that there was no modern facilities available in villages and many children were not required for agriculture.



7.3.2: Is younger Generation Interested in Agriculture?

To the question on "Is younger generation interested in agriculture?", more than 50 percent of the farmers said that they were not interested and just 10 percent said that they are interested with a 'great extent' of desire and all others said that they were half-heartedly interested. The pattern did not differ by size of cultivated holding, size of irrigated holding and size of drip irrigated holding.

The major reasons given by the farmers for the younger generation interested in agriculture were that agriculture was their traditional or family occupation and no alternative work or livelihood opportunities available. On the other hand the major reasons given by the farmers for the younger generation not interested in agriculture were many and they included low price for agriculture produce, nature not supportive, high input cost, high labour cost, require hard work and no regular income. These reasons did not differ much by size of cultivated holding, size of irrigated holding and size of drip irrigated holding.

Overall the farmers, including majority of medium/large farmers, were not keen on their children and their children were also not keen on taking up agriculture as their occupation mainly because agriculture income is not regular, often not viable due to high input and labour cost, and their intention to be more modern. FGDs and case studies indicated that even large farmers with drip irrigation wanted their children to have professional education that gives them a modern life with handsome income or get into a government or private job with an assured income

Table 7.1: Latest and previous supplier of drip/sprinkler by drip/sprinkler irrigated holding of household					
Manufacturer/Supplier	Drip/Sprinkler irrigated holding (acres)				
	Total	0.1-1.9	2.0-4.9	5.0-9.9	10.0+
Weighted cases (number)	418	112	212	78	16
Weighted cases (percent)	100.0	100.0	100.0	100.0	100.0
Number of Manufacturers					
One	94.4	100.0	95.7	84.8	86.2
Two	5.5	0.0	4.3	15.2	12.3
Three+	0.1	0.0	0.0	0.0	1.5
Latest Supplier of Drip/Sprinkler					
Jain	60.9	61.6	60.7	58.7	70.2
Netafim	3.8	2.0	3.4	7.4	2.8
Sairam	3.0	2.8	2.6	5.4	0.0
Kothari	3.0	4.6	2.7	2.2	0.0
EPC	2.5	2.8	2.0	4.2	0.5
Tulsi	2.3	2.4	2.0	3.3	0.0
Drip India	2.2	2.4	2.0	2.4	2.9
Nirmal	2.2	1.5	3.5	0.0	0.0
Phinolex	2.0	2.0	1.8	1.8	6.0
Kisan	1.6	0.3	1.7	2.7	4.5
Hasti	1.3	0.3	1.1	2.0	6.5
Other	15.1	17.3	16.5	9.9	6.7
Previous supplier of drip/Sprinkler					
Weighted cases (number)	23	0	9	12	2
Jain	44.1	NA	40.9	49.7	26.7
Others	55.9	NA	59.1	50.3	73.3

Table 7.2: How Latest drip/sprinkler company/ Manufacturer chosen			
Reasons for manufacturer	Total	Jain	Others
Weighted cases	418	254	163
Quality Better	74.7	86.5	56.1
Easily Available	40.3	37.7	44.3
Recommended by farmers	32.1	36.3	25.7
Recommended by Dealer	27.3	23.8	32.9
Popular/many Installed	19.6	23.0	14.3
Cheaper	28.9	21.2	40.9
Know this Company Only	13.3	17.2	7.3
After Sale Service	12.1	15.2	7.3
Advertisement/Exhibition	4.8	5.9	3.3

Table 7.3: Training, annual maintenance arrangements and experience of loss or damage in respect of latest installation of drip/sprinkler by drip irrigated holding and manufacturer of drip/sprinkler

Particulars	Drip Irrigated holding of household (acres)					Manufacturer	
	Total	0.1-1.9	2.0-4.9	5.0-9.9	10.0+	Jain	Others
Weighted valid cases	338	77	175	72	14	218	121
Training in installation and maintenance	21.3	20.4	21.2	23.7	14.7	19.5	24.4
Know how to maintain (de-clogging, etc)	90.5	89.6	89.7	91.9	99.3	92.6	86.8
Know how to dismantle and reassemble	93.8	93.3	92.6	95.9	99.4	94.1	93.1
Comprehensive maintenance contract (CMC)	3.1	5.6	2.4	2.3	2.0	3.6	2.3
Annual maintenance contract (AMC)	3.5	2.5	3.2	3.4	12.7	2.5	5.3

Table 7.4: Frequency of injecting fertilizer and chemicals and adequate pressure of drip set by manufacturer of drip set.

Particulars	Total	Jain	Others
Weighted total	339	218	121
Weighted percent			
Frequency of injecting fertilizer via drip?			
Not injected	52.3	49.2	57.9
Less than a week	13.9	16.9	8.6
Weekly/fortnightly	14.0	15.8	10.7
Monthly	9.3	8.0	11.8
Rarely	10.5	10.2	11.0
Frequency of injecting chemicals in drip to improve water flow			
Not injected	52.9	48.2	61.5
Less than a week	12.4	15.1	7.6
Weekly/fortnightly	9.4	9.9	8.5
Monthly	10.7	12.5	7.4
Rarely	14.6	14.3	15.1
Drip/sprinkler system pump gives adequate pressure	97.3	97.7	96.7
Experience of loss or damage			
Theft	2.1	2.2	1.9
Fire	3.3	3.0	3.9
Damage (Rat/ Squirrel)	37.9	38.3	37.2
Bust / Crack	19.4	19.4	19.4
Accidental Damage	2.8	3.6	1.4
Other	1.2	1.3	0.9

Table 7.5: Perceived reduction in water and electricity requirements, reduction in pest and diseases, and reduction in pest application due to drip by manufacturer.

% reduction	Total	Jain	Others
Total (weighted)	329	214	115
Total (Percent)	100.0	100.0	100.0
Reduced water requirements			
Nil	0.1	0.0	0.2
< 25%	18.2	18.9	17.0
25-49%	32.2	28.6	39.0
50-74%	46.0	48.8	40.9
75+%	3.4	3.7	2.9
Reduced electricity consumption			
Nil	6.3	6.2	6.6
< 25%	27.8	27.0	29.2
25-49%	33.6	34.4	32.1
50-74%	29.1	29.5	28.6
75+%	2.2	2.1	2.3
Reduced pest and diseases	53.5	54.0	52.4
Reduced rounds of pest application	48.9	49.5	47.7

Table 7.6: Reduction in labour for tilling, weeding, fertilizer application and harvesting due to drip irrigation by manufacturer			
Particulars	Total	Jain	Others
Total	100.0	100.0	100.0
Labour for tilling			
Increased	0.8	1.2	0.2
No change	35.6	32.5	40.1
Reduced 1-24%	2.6	3.5	1.2
Reduced 25-49%	18.9	18.0	20.1
Reduced 50-74%	36.4	38.6	33.0
Reduced 75+%	5.8	6.1	5.4
Labour for weeding			
Increased	0.8	1.2	0.1
No change	9.9	7.5	13.9
Reduced 1-24%	4.5	2.9	7.3
Reduced 25-49%	23.1	23.6	22.2
Reduced 50-74%	55.5	58.2	50.8
Reduced 75+%	6.2	6.6	5.6
Labour for Fertilizer application			
Increased	1.0	0.5	1.9
No change	24.0	21.5	28.5
Reduced 1-24%	5.3	6.8	2.7
Reduced 25-49%	19.0	18.4	20.0
Reduced 50-74%	34.9	37.9	29.6
Reduced 75+%	15.8	14.9	17.3
Labour for harvesting			
Increased 100+%	31.6	33.4	28.6
Increased 50-99%	22.6	22.4	22.7
Increased 1-49%	10.7	10.1	11.8
No change	21.0	19.9	22.8
Reduced	14.1	14.2	14.0

Table 7.7: Awareness, advantages and disadvantages of drip, aware of dealer, subsidy, and intension to install drip in the near future by cultivated holding and irrigated holding

Particulars	Cultivated holding of HH (acres)					Irrigated holding of HH (acres)				
	Total	<=2.5	2.6-5.0	5.1-10.0	10.1+	Total	0.1-1.9	2.0-4.9	5.0-9.9	10.0+
Awareness about drip *	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Heard and have knowledge	18.0	14.7	17.8	23.6	35.5	24.0	15.1	23.4	37.7	45.4
Heard but no knowledge	1.2	0.8	2.0	0.2	2.8	1.2	1.4	0.3	4.3	0.0
Not heard at all	80.8	84.5	80.2	76.2	61.6	74.7	83.5	76.2	58.0	54.6
Any training/information	2.2	1.4	2.3	3.9	4.8	3.7	2.0	2.9	7.1	11.0
Benefits/advantages **										
Save Water	89.2	87.0	86.2	94.3	100.0	90.2	90.5	85.3	95.5	100.0
Save Electricity	45.6	39.6	41.6	61.6	56.6	52.6	44.6	51.3	60.2	57.0
Tilling Easy / Economy	23.5	24.1	30.3	14.9	11.4	18.8	16.3	21.8	16.0	15.9
Weeding Easy / Economic	33.5	31.4	36.5	32.5	32.5	33.3	37.2	32.2	31.4	34.9
Can Apply Fertilizer	32.3	26.2	32.9	37.2	45.4	34.6	36.8	26.8	40.2	53.2
Higher Yield	64.7	68.2	65.5	64.3	48.9	62.5	75.1	64.1	52.0	54.1
Lower Cost of Cultivation	24.2	24.1	22.4	24.5	30.4	21.9	14.5	24.7	19.9	27.8
Disadvantages **										
Theft	7.0	8.6	5.5	4.4	11.1	6.1	6.9	6.1	2.9	12.1
Fire	2.6	2.8	3.0	0.0	5.3	3.7	4.7	4.5	0.2	6.5
Bust/crack	18.8	19.1	20.6	11.6	22.8	20.9	18.5	23.2	16.5	24.6
High cost	14.3	17.2	15.6	11.3	3.2	10.5	20.0	11.1	5.2	0.4
Water source required	12.5	13.6	14.7	10.8	2.8	8.4	12.3	8.6	6.4	4.7
High maintenance	6.8	4.6	5.7	16.0	3.9	8.3	11.0	7.8	8.4	5.1
large land required	5.3	9.0	3.0	4.8	0.0	5.1	14.5	4.0	1.0	0.0
None/No advantages	33.6	32.0	38.2	32.1	25.3	31.1	24.2	33.1	40.6	13.5
Any dealer nearby										
Aware	56.5	53.8	57.1	64.5	51.3	59.3	54.6	67.2	53.4	45.9
Not aware	39.1	43.4	38.6	34.1	32.9	35.9	43.1	28.5	40.0	45.9
Nobody in the area	4.3	2.7	4.4	1.4	15.9	4.8	2.2	4.3	6.6	8.2
Awareness of subsidy	52.1	46.1	48.4	57.9	79.2	61.0	64.0	53.4	70.2	69.2
Install drip shortly	42.0	30.9	41.8	52.8	67.8	53.0	33.7	52.5	67.1	62.1
Why not drip?										
High cost/No money	41.0	42.6	35.9	52.4	33.4	63.5	56.9	65.3	92.0	42.0
No water source	57.7	58.9	63.1	52.9	30.2	21.8	36.2	22.2	0.0	2.7
No large holding	15.1	23.3	12.4	0.0	3.9	17.1	30.2	15.0	4.8	0.0
Nobody to maintain	7.6	7.3	9.2	5.0	5.6	12.0	8.9	16.0	0.0	19.9

* Have knowledge means heard of drip/sprinkler and also knows what it is for; ** Among those who heard and have knowledge of drip/sprinkler. Note: Some less significant categories are excluded from the table.

Table 7.8: Perception of farmers about their sons' interest in taking up agriculture their profession, by cultivated holding, irrigated holding and drip irrigated holding of household.

Particulars	Cultivated holding (acres)			Irrigated holding (acres)			Drip Irrigated holding (acres)		
	Total	<=5.0	5.1+	Total	<5.0	5.0+	Total	<5.0	5.0+
Applicable cases (weighted)	1963	1490	473	1197	875	323	378	292	86
Want male children to be in agriculture	40.8	36.5	54.3	44.7	42.0	51.9	49.2	47.6	54.5
Why want male children in agriculture									
Traditional/family occupation	83.0	82.7	83.8	84.6	85.4	82.9	81.6	81.1	83.1
Agri is now profitable (drip)	40.9	34.0	55.5	50.7	39.0	76.3	84.5	82.6	91.2
Ensures food security	32.4	32.1	33.0	34.5	33.1	37.3	39.1	37.0	45.2
No other work available	22.6	23.5	20.6	20.8	23.0	15.9	19.7	20.6	17.1
Why not want male children in agriculture									
Agri not profitable	60.3	61.1	57.0	58.1	59.6	53.0	53.0	55.2	44.4
Drought/crop failure	47.6	47.8	46.7	43.2	46.3	33.1	49.6	49.0	51.8
Agri require hard work	44.3	43.7	47.0	46.1	47.0	43.3	34.5	35.1	32.0
Learn new skills	33.8	32.7	38.7	38.0	35.7	45.4	43.7	40.3	57.0
No facilities in villages	24.0	24.9	19.9	22.7	22.7	22.7	20.7	20.5	21.6
Many not require	18.7	19.2	16.5	20.8	21.7	17.7	18.9	20.9	11.1
Enjoy modern skills	11.7	10.6	16.8	13.4	11.4	19.8	19.3	17.1	27.7
Is younger generation interested in agriculture?									
Yes, great extent	10.6	9.1	15.6	13.2	11.4	18.3	17.6	17.2	19.2
Yes, some extent	32.0	29.5	40.4	34.4	33.6	36.5	33.2	31.8	38.0
Yes, large/drip farmers	4.1	4.2	3.4	4.4	4.3	4.8	4.5	4.0	6.0
Not shown interest	53.3	57.1	40.6	48.0	50.6	40.4	44.7	47.0	36.7
Why younger generation is interested in agriculture									
Traditional/family occupation	72.0	72.0	72.0	70.7	71.3	69.3	72.2	72.4	71.8
No alternate livelihood	49.4	50.8	45.8	46.5	46.2	47.3	45.9	45.6	46.7
Happy with agriculture	27.1	24.6	33.1	30.6	28.7	35.1	35.5	35.4	35.9
Modern agri profitable	27.0	25.7	30.2	30.3	27.3	37.3	41.0	41.1	40.7
Want to remain with family	18.6	17.6	20.8	20.0	19.9	20.3	19.2	20.0	16.9
Why younger generation not interested in agriculture									
Low price for yield	47.1	47.9	43.3	47.8	47.9	47.7	50.3	51.4	45.4
Nature not supportive	45.4	46.5	40.0	42.9	45.0	35.4	41.2	40.3	45.1
High input cost	38.5	37.9	41.6	41.6	41.5	41.8	51.0	50.8	51.5
High labour cost	35.5	35.1	37.5	37.7	36.5	42.0	43.6	45.1	36.8
Require hard work	32.4	30.6	40.7	34.4	33.2	38.9	26.2	24.8	32.3
No regular income	28.8	28.6	29.8	31.7	32.8	28.0	23.5	22.8	26.6
Untimed work required	18.9	18.6	20.2	20.3	18.6	26.2	21.4	24.6	7.2

Note: Some less significant categories are excluded from the table

CHAPTER 8:
Income and Expenditures

In this chapter income from different sources and expenditure on food and non-food items, are discussed.

8.1: Household Income

For the assessment of annual household income, the various sources of income considered are: agriculture/farm sources, livestock (sale of animals and products), casual labour (agriculture/farm including herding and related activities), casual labour (non-farm), salaried employment, pension/social security schemes, trade/business, remittances (by household members and non members), handicrafts/artisans/traditional-services/self-employment, local rural services (brokerage, performing functions, marriage related arrangements, conducting birth/death ceremonies) and others. It is to be noted that income from most of the above mentioned sources were recorded under work and common sources of income and in this section the reported incomes are combined and presented.

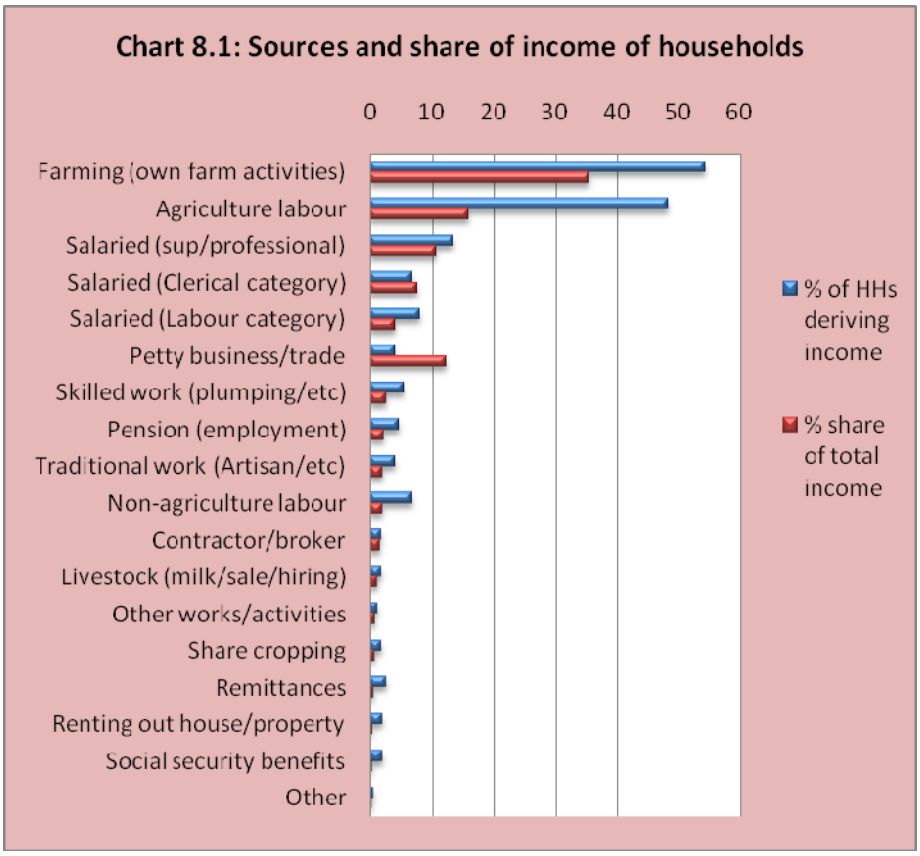
8.1.1: Sources of Income

Table 8.1 gives percent of households reporting income and percent of income from different sources, mean and median annual household income by source. Also chart 8.1 displays proportion of households and proportional share of income from different sources. It is seen from the table and from the chart that the maximum number of 54 percent of households reported income from own agriculture and 48 percent reported income from agriculture labour work. Another 7 percent reported income from non-agricultural labour. Further 14 percent of households reported income from petty business/trade and 16 percent reported income from some kind of salaried employment. Skilled work (plumping/electrical/etc), pension (due to employment), traditional work (artisan/craftsman/etc) were also attracted 3-5 percent of households.

With respect to percentage share of income it is seen that on average only 36 percent of the total household income had come from own agriculture and 16 percent of the income from agriculture labour work. Put together only 50 percent of the annual household income house-

holds had come from agricultural sector occupations and the remaining 50 percent of the income had come from non-agricultural sector occupations, primarily from salaried occupations (22 percent), petty business (11 percent) and a core of other occupations.

In general, most households in the study population depended on agriculture and/or agriculture labour work for their livelihoods but the income from agricultural sector occupations accounted for only 50 percent of the total income. That is, on average, households in rural areas generate 50 percent of their income from non-agricultural sector occupations and only 50 percent of their income is contributed by agricultural sector occupations.



8.1.2: Income Differentials

Table 8.2 depicts annual household income from different income sources by background characteristics (caste class, stratum/Drip density, study group, farmer category, and size of household income). The table and chart 8.2 and chart 8.3 show that the overall average (mean) annual household income was nearly Rs. 125,000 but the median income was Rs. 71,000 only. The median income indicates that only 50 percent of the households had their annual income more than Rs. 71,000 and the annual income of remaining 50 percent of the households was less

than Rs. 71,000. It also indicates that a small proportion of households had quite a few lakhs of income and that has the average household income to the high level of Rs. 125,000.

With respect to caste class, the average annual household income was as high as Rs. 1.67 lakhs for the general category whereas it was only Rs. 92 thousands for SC/STs, and OBC/SBC category stood in-between. The drip density had not shown any relationship with annual household income of households. For, the high drip density districts (stratum 1) the average annual household income was Rs. 1.14 lakhs whereas it was as high as Rs. 1.63 lakhs for low drip density districts and it was mainly due to a very high non-agricultural sector income of the households in these districts. However, it is interesting to note that the average annual household income was as high as Rs. 2.35 lakhs for drip/sprinkler irrigating households and as low as Rs. 77 thousands for rain-fed cultivating households. Further it is interesting to note that landless households were relatively better (85 thousands) than rain-fed cultivating farmers. However, among the farmers, the average annual household income was higher for small farmers (Rs. 1.33 lakhs) as compared to marginal farmers (Rs. 78 thousands), and the income of medium/large farmers (Rs. 3.98 lakhs) was substantially higher than the income of semi-medium farmers (Rs. 2.09 lakhs). Among all categories of farmers, only up to 60-70 percent of annual income was derived from agricultural activities and the remaining income was derived from other sources.

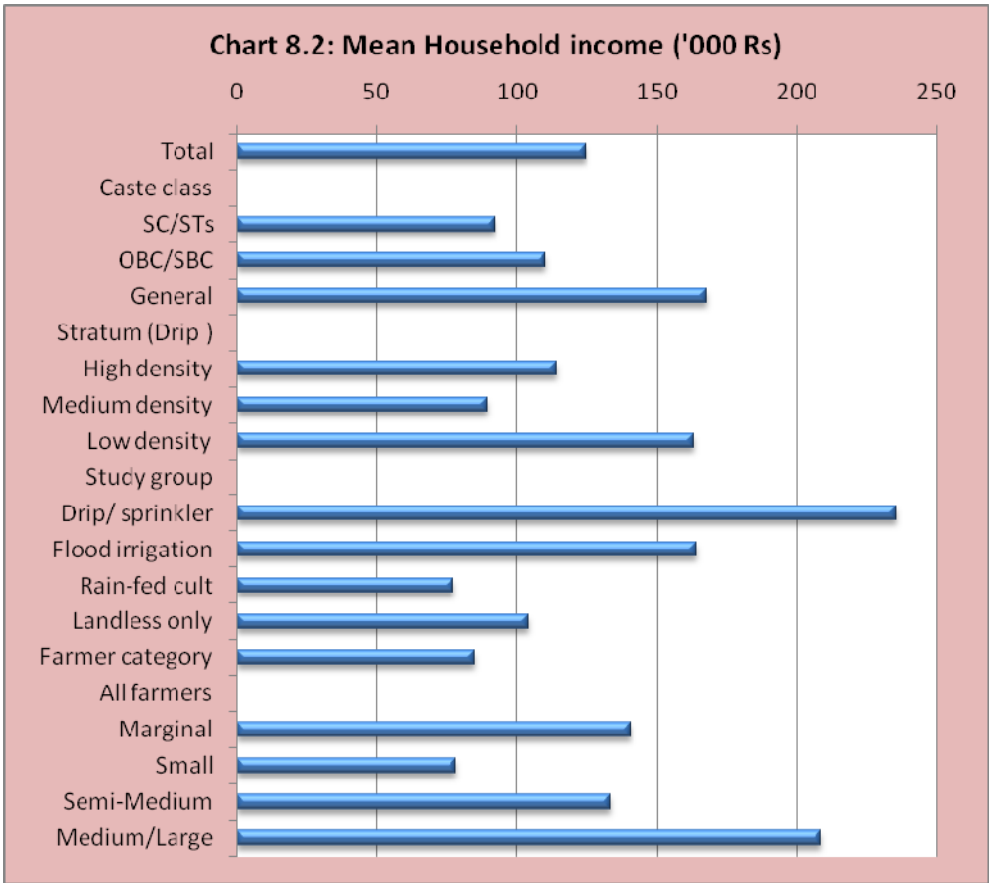
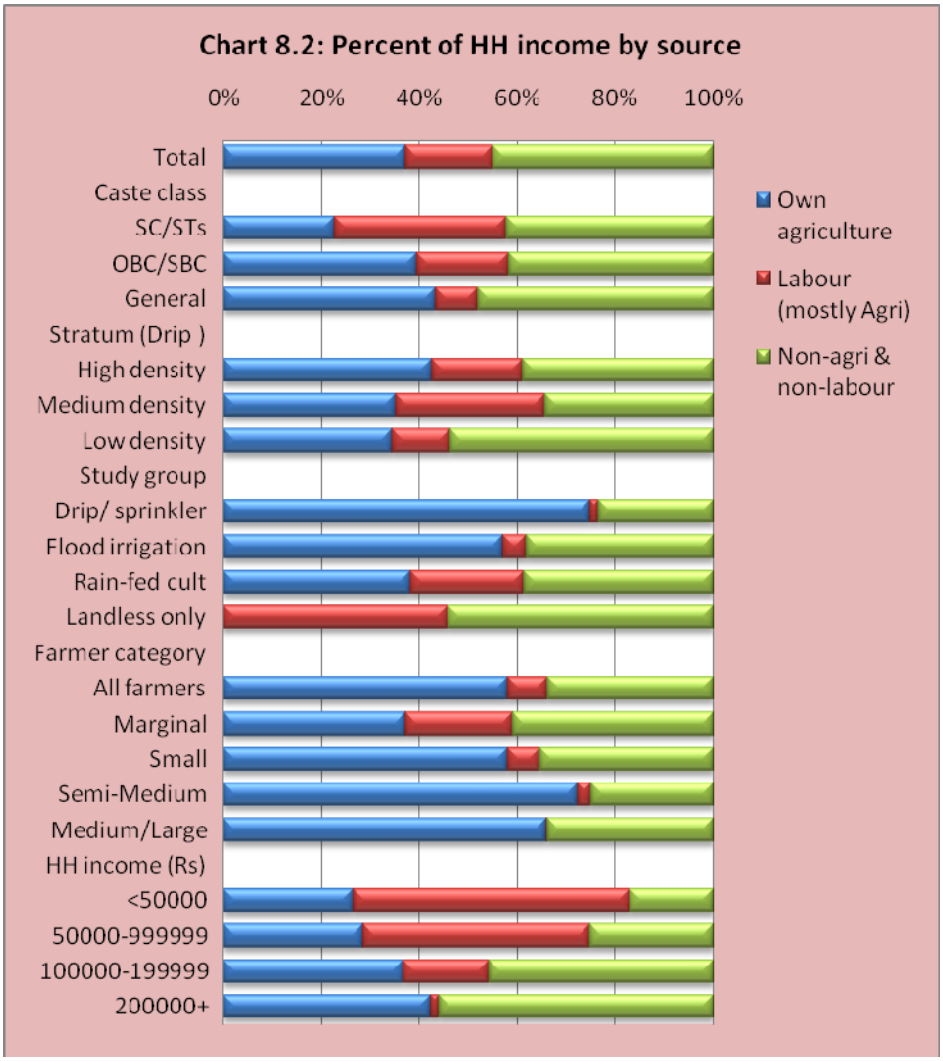


Chart 8.2: Mean Household income ('000 Rs)
0
50
100
150
200
250
Total
Caste class
SC/STs
OBC/SBC
General
Stratum (Drip)
High density
Medium density
Low density
Study group
Drip/ sprinkler
Flood irrigation
Rain-fed cult
Landless only
Farmer category
All farmers
Marginal
Small
Semi-Medium
Medium/Large



8.2: Household Expenditure

The household expenditures are broadly divided into two categories, namely food and non-food items. Expenditure on food items were obtained in respect of each item or category of items and sources from which the food items were obtained, while non-food item expenditures were sub-divided into those items for which expenditures are usually met every month and those items for which expenditures are met occasionally or annually.

8.2.1: Expenditure on Food Items

First, the households were asked to give details of food items consumed in the last one year, item/category-wise and source-wise. The food items considered are: cereals/staple food items like rice/flour, wheat/flour/maida, jowar/flour, other cereal items; pulses and spices items like pulses/pulse products, spices/salt/kirana items, edible oil and vanaspati, sugar/gaur/honey,

tea/coffee/etc; vegetables, meat, fruit items like vegetables, milk, chicken/meat/fish, fruits and nuts, ghee/butter, egg; bakery, hotel and related items like milk products/baby food, bakery products/biscuits, and hotel/cooked food items. Further sources of each item such as household produce, obtained from public distribution system (PDS), and purchased from open market. In respect of each source the quantity used per year and its value were obtained. However in respect of items purchased the assessment was made for the quantity purchased per month and the number of months purchases made. In case the quantity was small or could not be specified its value was assessed. It is to be noted that the responses to the quantity and its value reported and the estimates of expenditure on food items can only be treated as approximate.

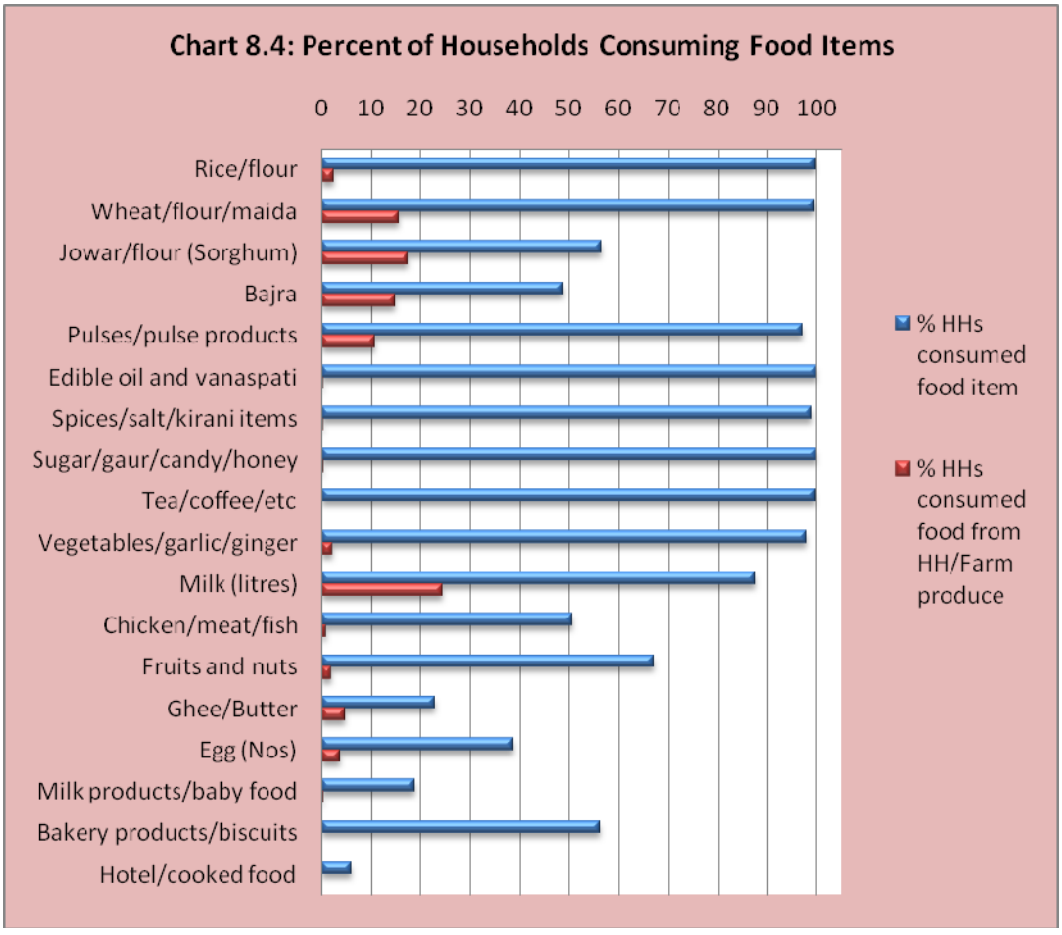


Table 8.3 gives percent of households consumed different food items obtained through different sources and their mean values in rupees. The individual food sources considered are farm produce, PDS and purchased. It is seen from the table that a little more than one-third of the households (37 percent) had used cereals/pulses from their farms but only each 10-15 percent of the households had used wheat, jowar (sorghum) and bajra and just 3 percent used rice obtained from their own farms. It is to be noted that the percent of households using bajra, jowar

and wheat will more than double if only cultivated holding households are considered and it would be almost all households if only the households cultivating these crops are considered. Similarly one-fourth of the households had consumed milk obtained from their own livestock. It appears that most of the households who produced grain, pulses or milk, consumed at least part of the produce. But unfortunately most of the households cultivated more of cash crops than of food crops with commercial motives.

The value of the own farm produced cereals consumed per household during the one year period before the survey was estimated at Rs. 6,800 on the average. Also nearly 60 percent of the households reportedly received wheat and rice from the public distribution system (PDS) but only 16 percent of the households reportedly received edible oil and 24 percent received sugar from PDS. The mean expenditure on food items obtained from PDS per household in one year period as reported by the households worked out to Rs. 1600.

Otherwise most of the households purchased most of the food items from the open market. Wheat and rice were purchased from the market by around 70 percent of the households, pulse/pulse products were purchased by almost all households, jowar and bajra by around 50 percent of the households, spices/salt/grocery, edible oil and vanaspati, sugar/gaur/honey, tea/coffee and vegetables were purchased by almost all households. Non-vegetarian items like chicken, fish, meat and egg were reportedly purchased by around 50 percent of the households. Further milk/milk products and fruits/nuts were also purchased by more than 75 percent of the households.

In all, the total value of food items consumed per household over the one year period worked out to around Rs. 2000-4000 on each of the items namely wheat, pulses, edible oil and spices and vegetables. The average total value of food items consumed per household per year worked out to Rs. 38,700.

8.2.2: Expenditure on Non-food Items

Table 8.6 gives percent of households that incurred expenditure and mean and median amount of expenditure on various non-food items. It is seen from the table that most or at least majority of the households had expended on many non-food items like lighting (electricity, solar energy, etc); fuel (gas, kerosene, firewood, cow dung, etc); toilet and sundry articles (includes toothpaste, hair oil, soap, face powder, etc); conveyance (includes bus fare, taxi charges, diesel, petrol, etc.); consumer services (tailoring, grinding, legal expenses, etc.), smoking, chewing, drinking, gambling and related; medical expenses; taxes (house tax, vehicle tax, insurance, etc); clothing, bedding and footwear; expenditure on special occasions (birth, death, ceremonies) and so on. The average annual household expenditure on non-food items worked out to Rs. 50,400. However the expenditures varied for different items but for each category of items it

was Rs. 2000 to 4,000 per year except medical expenses. Regarding medical expenses nearly one-fourth of the households had spent each an average amount of about Rs. 25,000 on medical care during the past one year and 75 percent had spent about Rs. 4500 towards medicine and clinical consultation. It appears that medical expenses are one of the major non-food expenses in the study population.

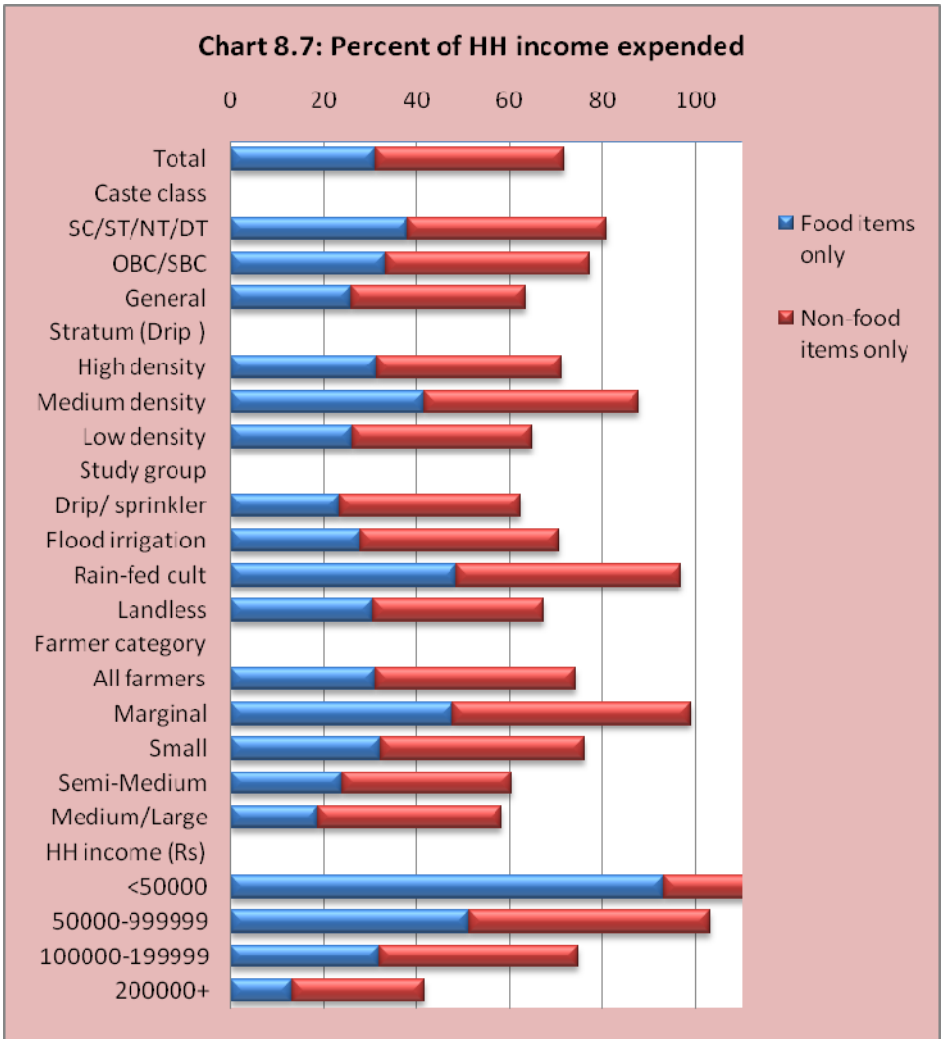


Table 8.7 gives percent of households that incurred expenditure and mean amount of expenditure on food and non-food items by caste class, stratum, study group, farmer category and household income. Assuming that is study has captured almost expenditures and all major expenses, it may be said that generally the total annual expenditure was less than the annual income of the household but the difference was marginal. Except for general caste class, medium and large landholding households, the expenditure was 70 to 80 percent of their annual income. And, in case of households with annual household income less than Rs. 1 lakh the reported expenditure exceeded the reported annual household income.

Table 8.1: Percent of households deriving income and mean and median income per household by source of income

Source of income	All households			Income deriving households	
	% of HHs deriving income	% share of total income	Mean income per HH	Mean income per HH	Median income per HH
Total	NA	100.0	NA	124311	NA
Farming (own farm activities)	54.3	35.5	44112	81302	37011
Agriculture labour	48.2	16.0	19862	41212	34024
Petty business/trade	13.5	10.6	13237	97920	54109
Salaried (supervisor/professional)	4.0	12.3	15329	387673	239051
Salaried (Clerical category)	6.7	7.6	9406	139546	131024
Salaried (Labour category)	5.3	2.5	3077	58156	47403
Skilled work (plumping/electrical/etc)	7.9	4.0	5023	63252	47055
Pension (employment)	4.6	2.1	2666	57345	47292
Traditional work (Arti-san/craftsman/etc)	4.1	2.0	2472	60932	36787
Non-agriculture labour	6.9	2.0	2443	35628	27939
Contractor/broker	1.8	1.5	1860	102900	107355
Livestock (milk/sale/hiring)	1.7	1.0	1302	75096	24006
Other works/activities	1.2	0.8	950	82535	35374
Share cropping	1.7	0.7	833	48540	19209
Remittances	2.6	0.4	542	20760	7884
Renting out house/property	1.9	0.4	506	26711	14482
Social security benefits (pension)	1.9	0.3	372	19284	5855
Other	0.5	0.3	320	62382	29644

Table 8.2: Mean and median annual household income from different income sources by background characteristics of households.

Characteristics	Annual HH income			% HHs derive income from:			Percent of income from:			
	Mean income (Rs)	Median income (Rs)	Ist 25% income (Rs)	Own agri-culture	Labour (agri/ non-agri)	Non-agri & non-labour	Own agri-culture	Labour (agri/ non-agri)	Non-agri & non-labour	Total
Total	124,328	71,248	40,311	56.0	51.3	43.9	37.2	18.0	44.8	100.0
Caste Class										
SC/STs	92,060	60,501	37,303	39.0	66.3	40.0	22.7	35.0	42.2	100.0
OBC/SBC	110,161	71,346	40,323	57.3	51.5	42.6	39.4	18.9	41.6	100.0
General	167,889	86,057	45,725	70.8	36.8	48.9	43.3	8.6	48.1	100.0
Stratum (drip density)										
Stratum1&2: High density	114,128	69,694	38,330	52.7	55.8	37.7	42.5	18.7	38.8	100.0
Stratum3: Medium density	89,210	58,921	35,771	50.7	58.4	40.1	35.3	30.6	34.2	100.0
Stratum 4: Low density	163,117	88,556	49,400	63.6	41.0	53.1	34.5	11.8	53.7	100.0
Study Group										
Drip/ sprinkler	235,266	151,612	83,973	99.0	15.7	36.4	74.8	1.8	23.4	100.0
Flood irrigation	164,186	99,773	54,571	99.3	24.6	43.8	57.2	4.6	38.2	100.0
Rain-fed cultivation	77,173	55,435	32,507	96.4	54.0	36.3	38.3	23.2	38.5	100.0
Non-cultivating/landless	103,979	62,154	37,278	3.7	71.1	49.6	1.9	34.7	63.5	100.0
Landless only	84,613	60,424	37,298	0.3	76.3	45.9	0.0	45.8	54.1	100.0
Farmer category										
All farmers	140,692	80,258	44,811	98.0	35.3	39.3	58.2	8.0	33.8	100.0
Marginal (<=2.5)	77,899	59,171	35,247	97.4	51.8	39.2	37.2	21.9	40.9	100.0
Small (2.6-5.0)	133,365	87,164	48,478	98.1	29.6	38.8	58.1	6.6	35.3	100.0
Semi-Medium (5.1-10.0)	208,802	138,853	66,296	98.9	17.8	35.5	72.3	2.9	24.8	100.0
Medium/Large (10.1+)	398,196	259,809	117,857	99.5	4.7	52.0	65.9	0.4	33.7	100.0
HH Income										
<50000	30,693	32,458	22,361	47.3	66.2	26.4	26.6	56.4	17.0	100.0
50000-999999	70,854	70,317	58,784	51.2	64.6	37.1	28.5	46.4	25.1	100.0
100000-199999	140,077	135,598	115,388	64.4	34.0	61.6	36.7	17.5	45.8	100.0
200000+	439,974	333,817	249,126	74.8	11.6	74.7	42.2	1.8	56.0	100.0

Table 8.3: Item-wise percent of households, mean quantity and mean value/expenditure on food consumed during the one year period preceding the survey.

Food item	HH/Farm produce			PDS			Open market			Total consumption		
	%HHs	Qty	Value	%HHs	Qty	Value	%HHs	Qty	Value	%HHs	Qty	Value
Rice/flour *	2.5	253	5294	57.8	120	739	67.3	109	2009	99.8	149	1912
Wheat/flour/maida	15.5	459	5998	53.9	176	933	65.0	261	3940	99.5	338	4015
Jowar/flour (Sorghum)	17.4	290	5090	0.0	0	0	41.1	165	3479	56.7	209	4083
Bajra	14.8	305	3403	0.0	0	0	35.3	170	2312	48.7	215	2704
Ragi/flour	0.1	157	3142	0.0	0	0	0.5	76	1042	0.5	82	1197
Other cereal items	1.6	182	2811	0.0	0	0	16.7	39	1577	17.9	52	1716
Pulses/pulse products	10.5	74	2496	0.8	4	168	94.6	35	2330	97.2	42	2539
Edible oil and vanaspati	0.1	98	1626	16.3	4	134	99.6	56	3851	99.9	56	3863
Spices/salt/kirani items	0.2	9	852	0.0	0	0	98.9	a	5640	98.9	a	5640
Sugar/gaur/candy/honey	0.3	a	830	24.2	17	266	98.7	76	2261	99.9	79	2302
Tea/coffee/etc	0.0	a	0	0.0	0	0	99.8	a	1190	99.8	a	1190
Vegetables/garlic/ginger	2.0	a	915	0.0	0	0	97.6	a	3967	97.8	a	3975
Milk (litres)	24.3	317	6118	0.0	0	0	69.3	191	4529	87.7	238	5270
Chicken/meat/fish	0.8	11	1061	0.0	0	0	50.1	33	3859	50.6	32	3834
Fruits and nuts	1.8	a	1589	0.0	0	0	66.6	a	1406	67.3	a	1436
Ghee/Butter	4.6	11	2440	0.0	0	0	18.4	45	2366	22.8	a	2408
Egg (Nos)	3.5	72	501	0.0	0	0	35.7	47	719	38.7	50	710
Milk products/baby food	0.4	165	1305	0.0	0	0	18.3	a	1299	18.6	a	1303
Bakery products/biscuits	0.0	a	0	0.0	0	0	56.4	a	1117	56.4	a	1117
Hotel/cooked food	0.0	a	0	0.0	0	0	6.0	a	3636	6.0	a	3636
Other bakery/hotel items	0.1	7	166	0.0	0	0	2.7	a	2937	2.7	a	2907
All cereals combined **	36.6	481	6767	58.2	282	1596	91.9	410	6856	100.0	718	9853
All items combined	51.2	a	8618	59.0	a	1721	98.8	a	32123	100.0	a	38658

Note: 'Qty' and 'Value' are mean values for the households who consumed the corresponding food item only. Qty excludes cases who reported expenditure but not quantity and as such 'rate per kg' may not give the correct picture. "a" quantity not applicable; '*' Farm produced paddy was assumed as rice=two-thirds of paddy; '**' includes rice/flour, wheat/flour/maida, jowar/flour, bajra, ragi/flour and other cereal items

Table 8.4: Percent share (quantity and value/expenditure) of select food items consumed from different sources.

Select food items	Total	Quantity			Value/Expenditure		
		HH/farm produce	PDS	Pur-chased	HH pro-duced	PDS	Pur-chased
Rice/flour	100.0	6.1	45.7	48.2	6.8	22.4	70.8
Wheat/flour/maida	100.0	21.2	28.3	50.5	23.3	12.6	64.1
Jowar/flour	100.0	42.7	0.0	57.3	38.2	0.0	61.8
Ragi/flour	100.0	14.3	0.0	85.7	19.5	0.0	80.5
Bajra	100.0	42.9	0.0	57.1	38.1	0.0	61.9
Other cereal items	100.0	30.5	0.0	69.5	14.3	0.0	85.7
Pulses/pulse products	100.0	19.2	0.1	80.7	10.7	0.1	89.3
Milk	100.0	36.8	0.0	63.2	32.1	0.0	67.9
Egg	100.0	13.3	0.0	86.7	6.4	0.0	93.6
Ghee/Butter	100.0	NA	NA	NA	20.6	0.0	79.4
All cereals combined	100.0	24.5	22.9	52.6	25.5	9.6	64.9
All items combined	100.0	NA	NA	NA	11.9	2.7	85.4

Table 8.5: Percent of households, percent quantity and percent value/price of food items obtained from different sources, classified by background characteristics of households.

Background Characteristics	% of households obtained CEREAL food items from:			% Quantity of CEREAL food items obtained from:			Total value/price of food items (Rs)		
	HH produce	PDS	Open market	HH produce	PDS	Open market	Cereal items	All food items	%cereal items
Total	36.6	58.2	91.9	24.5	22.9	52.6	9,853	38,658	25.5
Caste class									
SC/ST/NT/DT	27.3	66.6	90.7	19.3	28.5	52.2	9,123	35,219	25.9
OBC/SBC	33.2	57.2	92.6	19.3	24.5	56.1	8,932	36,819	24.3
General	48.4	51.1	92.3	33.3	16.7	50.1	11,397	43,604	26.1
Stratum									
Stratum1&2: High density	30.7	48.6	91.4	20.5	24.1	55.5	8,057	35,902	22.4
Stratum3: Medium density	32.7	68.1	91.1	21.0	27.9	51.0	10,117	37,263	27.2
Stratum 4: Low density	45.4	59.1	93.0	30.5	18.0	51.4	11,357	42,450	26.8
Study group									
Drip/ sprinkler	60.0	39.0	94.0	39.4	10.4	50.2	13,136	54,809	24.0
Flood irrigation	68.1	51.2	88.4	47.5	14.8	37.7	12,007	46,009	26.1
Rain-fed cultivation	56.3	65.0	87.7	26.2	24.4	49.4	9,982	37,481	26.6
Not cultivating/ landless	5.3	62.4	95.3	2.8	31.5	65.7	7,971	31,968	24.9
Farmer category (acres)									
All farmers	61.7	54.7	89.1	37.5	17.7	44.7	11,365	44,037	25.8
Marginal (<=2.5)	57.0	62.7	89.4	31.2	23.6	45.2	9,825	37,347	26.3
Small (2.6-5.0)	61.0	54.1	89.1	35.0	17.8	47.2	11,497	43,158	26.6
Semi-Medium (5.1-10.0)	68.1	47.5	86.6	45.6	12.1	42.2	12,658	49,828	25.4
Medium/Large (10.1+)	78.6	26.9	92.5	57.2	4.6	38.2	16,983	75,328	22.5
Annual HH income (Rs)									
<50000	29.1	62.8	91.9	16.8	27.5	55.8	8,888	34,350	25.9
50000-999999	62.8	52.3	89.9	40.5	15.5	44.0	12,496	46,609	26.8
100000-199999	60.3	43.9	91.5	44.9	11.9	43.2	12,194	51,320	23.8
200000+	53.3	27.9	95.2	43.7	6.7	49.6	14,379	63,159	22.8

Table 8.6: Annual expenses on non-food items, item-wise					
	Non-food items	%HHs expend	Mean (Rs)*	Median (Rs)*	All HHs Mean
	Monthly expenses (summed up for one year)				
1	Lighting (electricity, solar energy, etc)	90.5	2910	2316	2635
2	Cooking fuel (gas, kerosene, firewood, cow dung, etc)	93.1	2530	1724	2355
3	Toilet and sundry articles (toothpaste, hair oil, toilet/washing soap, etc.)	99.6	2521	2196	2510
4	Conveyance (bus, taxi, diesel, petrol, school bus/van, etc.)	88.6	6898	3531	6113
5	Consumer services (servant, tailoring, legal expenses, pet animals, etc.)	97.0	1569	916	1522
6	Entertainment and communication (cinema, cable, news paper, etc.)	41.1	1888	1446	777
7	Telephone/Mobile recharge	81.7	2606	1740	2127
8	Home maintenance articles (cookware, glassware, bucket, agarbati, etc.)	89.1	1273	972	1134
9	Smoking, chewing, drinking, gambling and related	49.6	1915	1157	950
10	Medical expenses (non-institutional/common/regular)	75.1	4504	2346	3384
	Occassional expenses (during one year)				
11	Medical expenses (institutional/major expenses)	23.9	24126	9929	5761
12	Taxes (house, vehicle, insurance, etc)	90.8	1322	506	1200
13	Tuition fees & other fees (including private tution, etc.)	53.7	7846	1761	4214
14	School books & other educational articles	53.7	2999	952	1609
15	Clothing, bedding and footwear	96.9	3499	2902	3389
16	Repair and maintenance (residence, equipment, etc.)	22.9	24692	1915	5660
17	Expenditure on special occasions (birth, death, ceremonies)	42.2	11080	1462	4676
	Durable goods (during one year)				
18	Furniture and fixtures (bedstead, almirah, suitcase, carpet, etc.)	8.4	4277	1945	359
19	Crockery & utensils (stainless steel, utensils, thermos, etc.)	34.2	930	413	318
20	Household appliances (fan, sewing machine, washing machine, etc.)	19.1	1109	179	212
21	Goods for recreation (TV, radio, musical instruments, etc.)	12.6	1806	187	227
22	Personal goods (clock, watch, PC/Laptop, mobile, etc)	20.9	2176	1431	454
23	Personal transport equipment (bicycle, scooter, car, tyre & tubes, etc.)	30.4	5918	1970	1802
24	Therapeutic appliances (eye-glass, orthopedic equipment, etc.)	20.3	541	365	110
25	Jewellery and ornaments	6.4	21708	9921	1399
26	Other Monthly expenses (any items)	26.4	2449	1031	646
27	Other personal expenses	6.2	8049	952	495
28	Other items/expenses	9.3	4734	993	441
* Mean and median are for the households who met expenditure on the item					

Table 8.7: Mean income, mean expenditure on food and non-food items and percent of income spent on food and non-food items by background characteristics of households.

Background characteristics	Mean income/expenditure (Rs)			% of income for expenditure on		
	Income (Rs)	Food items	Non-food items	food & non-food items	Food items only	Non-food items only
Total	124,328	38,658	50,359	71.6	31.1	40.5
Caste Class						
SC/STs	92,060	35,219	39,207	80.8	38.3	42.6
OBC/SBC	110,161	36,819	48,247	77.2	33.4	43.8
General	167,889	43,604	62,837	63.4	26.0	37.4
Stratum (drip density)						
Stratum1&2: High density	114,128	35,902	45,344	71.2	31.5	39.7
Stratum3: Medium density	89,210	37,263	40,943	87.7	41.8	45.9
Stratum 4: Low density	163,117	42,450	62,945	64.6	26.0	38.6
Study Group						
Drip/ sprinkler	235,266	54,809	91,735	62.3	23.3	39.0
Flood irrigation	164,186	46,009	70,031	70.7	28.0	42.7
Rain-fed cultivation	77,173	37,481	37,269	96.9	48.6	48.3
Non-cultivating/landless	103,979	31,968	38,032	67.3	30.7	36.6
Farmer category						
All farmers	140,692	44,037	60,272	74.1	31.3	42.8
Marginal (<=2.5)	77,899	37,347	39,725	98.9	47.9	51.0
Small (2.6-5.0)	133,365	43,158	58,150	76.0	32.4	43.6
Semi-Medium (5.1-10.0)	208,802	49,828	76,495	60.5	23.9	36.6
Medium/Large (10.1+)	398,196	75,328	157,049	58.4	18.9	39.4
HH Income						
<50000	30,693	28,634	25,801	177.4	93.3	84.1
50000-999999	70,854	36,420	36,600	103.1	51.4	51.7
100000-199999	140,077	44,955	59,768	74.8	32.1	42.7
200000+	439,974	58,127	124,944	41.6	13.2	28.4

Note: Expenditure on food items includes value of farm/HH produce used. Figures underlined are excess expenditure than income.

CHAPTER 9:
Fertility, Health and Nutrition

In this chapter we discuss birth rates, fertility rates, infant mortality rate, birth order statistics, illness among household members and nutritional status of children, adolescents and ever married women of reproductive age.

9.1: Birth and fertility Rates

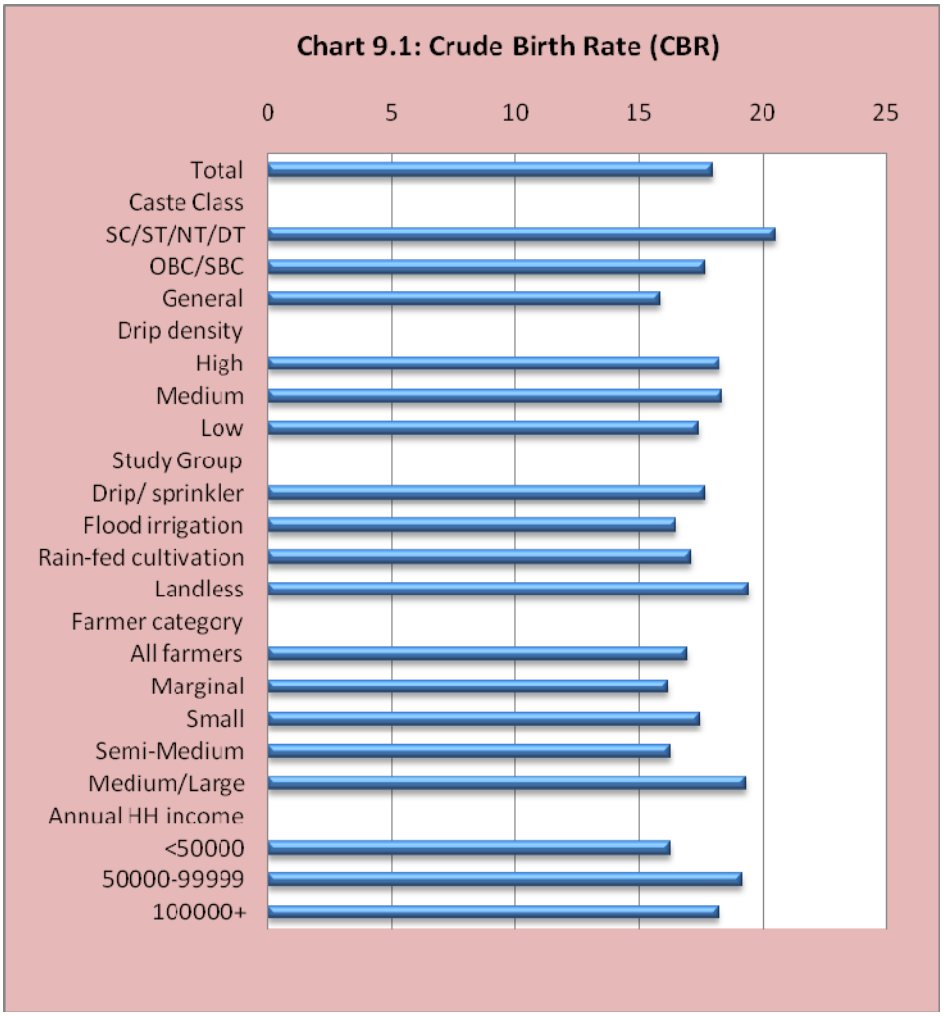
In the survey the respondents were asked if any birth had occurred to any member of the household during the past six years. The 6 year reference period started from May 2005 at the time of starting field survey and July 2005 at the time of conclusion of field survey, so that all births occurred since January 2006 are captured. The question was asked only after enumeration of household members so that all children born during the reference period and surviving at survey could be accounted for in the births list. All households were also specifically asked if any birth occurred during the reference period and the child died on the same day of birth, or later. In respect of all births reported, the date of birth was assessed and if the date was 1 January 2006 or later the details of the births were recorded.

9.1.1: Crude Birth Rate

Table 9.1 gives the number distribution of births occurred since January 2006 until December 2010, enumerated population in 2011, crude birth rate per year (births per year per 1000 population) by background characteristics of the study population. It is seen from the table that the crude birth rate (CBR) per 1000 population per year for the reference period 2006-2010 was 18 for the study population. A CBR of 18 in the study population (rural Maharashtra) is an indication of low fertility in the area. The crude birth rate was substantially higher at 20.5 for SC/STs and much lower at 15.9 for the general category. However the crude birth rate was only slightly higher (19.4) as compared to all farmers combined (17.0) but among the farmers the variation was negligible, except among medium/large farmers (who constitute a small proportion of population) for whom the CBR was slightly higher at 19.4. Further, drip/sprinkler irrigating farmers did not differ from other farmers in terms of their CBR level.

9.1.2: Total fertility Rate

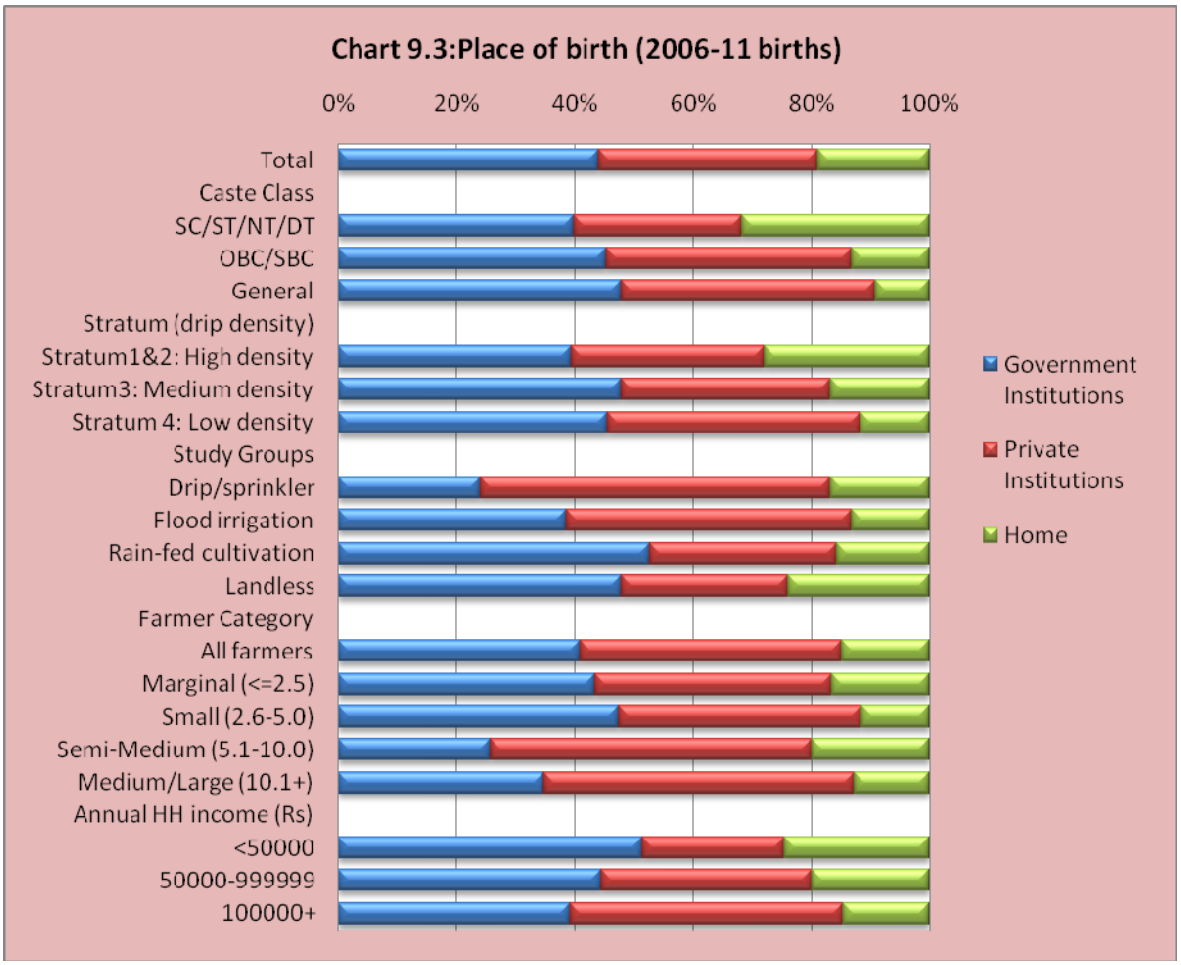
With respect to fertility levels, the total fertility rate (number of life-time births per woman based on current schedule of fertility) was 2. It means that on average one woman bears two children in her life time. A total fertility rate (TFR) of 2 also means replacement fertility; that is, a couple (2 persons) retire from reproductive life leaving behind two persons to take up the role of reproduction. Please note that it does not mean zero population growth. As in the case of CBR, TFR also varied marginally between different groups. Also drip/sprinkler irrigated farmers showed only slightly lower fertility than flood irrigated and rain-fed cultivated farmers.



9.1.3: Place of Birth and Birth Attendant

Table 9.3 gives percent distribution of births (2006-11 births) by place of birth and birth attendant, classified by order of birth. Further table 9.4 gives percent distribution of births of 2006-2011 by place of birth, classified by selected background characteristics of household. Overall, more than 80 percent of the reference period births had occurred in health institutions

such as government hospitals, private hospitals and primary health centre, community health centre and health sub-centres (PHC/CHC/HSC) and only 19 percent of births had occurred in homes. The proportion of births occurred in government institution was 44 percent and that occurred in private institution was 37 percent. In other words, among the institutional births, 54 percent had occurred in government institutions and the remaining 46 percent had occurred in private institutions. However among all the births only 30 percent had occurred in rural government health institutions such as Primary Health centre (PHC), Community Health centre (CHC) and Health Sub-centre (HSC).



Most of the home births were attended by traditional births attendants. The institutional births were relatively more among the general caste category but the proportion of births in government institutions was almost equally high among SC/STs (40 percent) as that among OBC/SBCs and general category (46 percent). On the other hand proportion of births occurred in private institutions was 28 percent among SC/STs as against 42-43 percent among other caste groups. These indicate that government services were utilized more by SC/STs than by other caste

groups. Otherwise, only marginal differences were notice in institutional births and births in government institutions by background characteristics of the households.

With regard to registration of births, it is seen from the table that, according to the respondents, more than 95 percent of the births were registered and in case of the remaining births the registration status was not known. The registration of births was relatively less in case of home births (86 percent) than in case of institutional births (98 percent).

9.1.4: Birth Order Statistics

Table 9.5 gives percent distribution of births of 2006-11 (up to survey) by order of birth, classified by place of birth/birth attendant. It is seen from the table that among the births occurred during 2006-11, overall 44 percent of the births were first order births and another 36 percent were second order births. Put together, more than 80 percent of the births were first or second order births. On the other hand, just 6 percent of the births were 4^{th} and higher order births. It confirms the pattern of low CBR and TFR observed above. Among institutional births more than 80 percent were first or second order births while it was only 64 percent among home births.

9.1.5: Infant Mortality Rate

Reliable estimate of infant mortality rate (IMR) requires higher sample size. However we have tried to estimate IMR based on births for the 4 year reference period 2006-09 so that the number of birth events is increased. The weighted number of births in the estimation of IMR was 1409 and the weighted number of infant deaths among these live births was 27 and the infant mortality rate worked out to 23.25 and the sex-ratio of births was 827 (females per 1000 males births). It is to be noted that for reliable estimation of IMR the thumb rule is that we require about 200 infant deaths and as such the estimate is subjected to higher sampling variability. However the Low IMR estimated from the survey indicates that IMR in rural Maharashtra was very low but at the same time the sex ratio of the births was also very low.

9.2: Morbidity in the Population

In this section illness among household members during the past one year before the survey including duration of illness, hospitalization, work/study interruption and expenditure on treatment are discussed.

9.2.1: Extent of persons ill

A few questions were asked to the respondents as to, during the past 12 months, whether any member of the family was seriously ill, chronically ill, under prolonged or lifelong medication,

bed ridden, and the like. If the answer was 'yes' then the number of persons ill during the past one year, and for each person, nature of illness, duration of illness, hospitalization for the illness, duration of interruption of occupation/study, expenditure incurred and current status of illness, were enquired. It is to be noted that minor illness/ailments were not considered as our interest was on human resource wastage and household expenditure on medical care (major events) that have implications for the livelihoods strategies of the families.

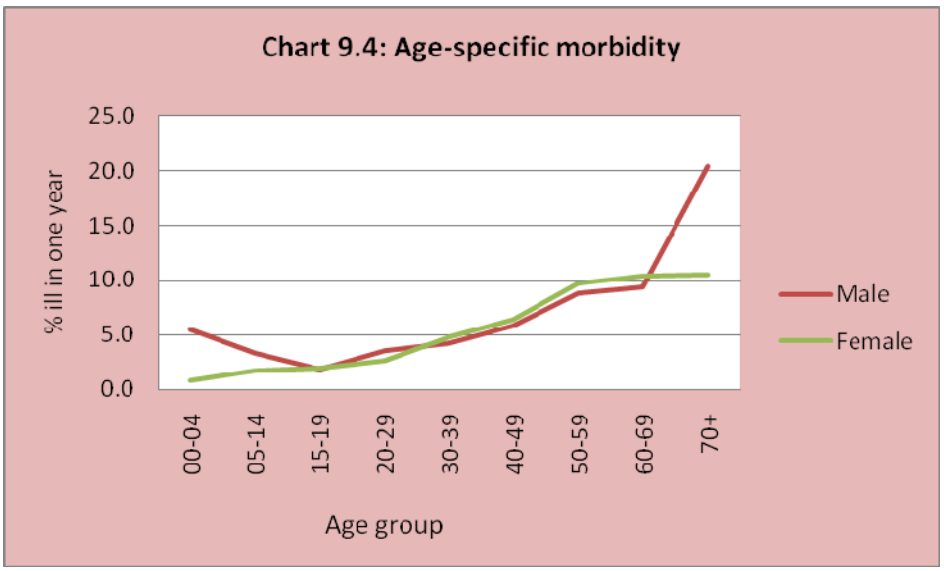
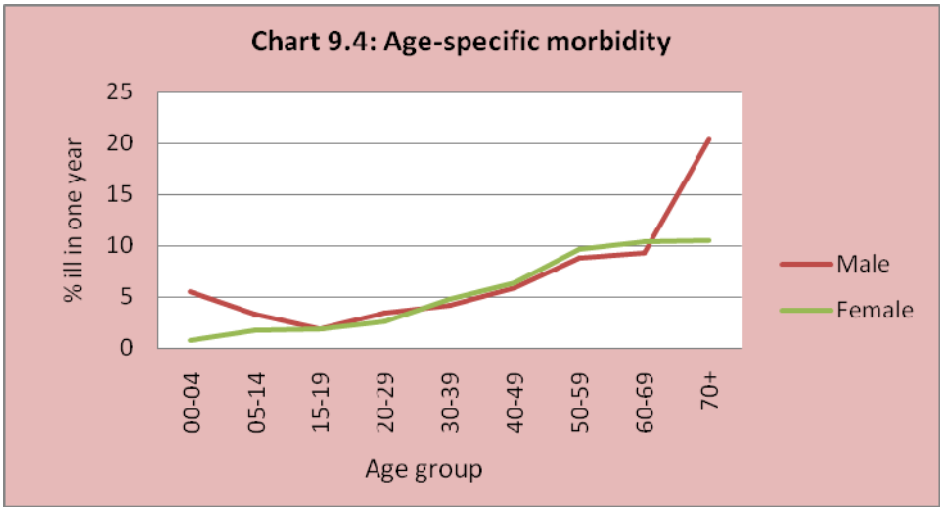


Table 9.6 gives percent of males and females ill any time during the last one year period before the survey by age and sex, and table 9.7 gives percent of persons ill by age, classified by background characteristics of household. Overall around 5 percent of males and females are reportedly ill with a major cause (according to the respondent) any time during the past one year before the survey. The incidence of illness was only slightly higher among males than among females. The proportion of persons ill was lower up to age 39 and increases thereafter (see chart 9.4). Among the persons in the age group 60+ as many as 12 percent of males and females were ill any time in the one year period before the survey.

Table 9.7 gives percent of persons reported ill any time during the last one year by age and background characteristics. The extent of persons ill did not differ much by the background characteristics of the households. In fact the morbidity was reportedly higher among drip/sprinkler and flood irrigated farmers as compared to their counter parts. It is not sure if the morbidity was higher among these groups or that they seek health care more often than others, but it appears that the findings indicates mainly their better heath seeking behaviour mainly because of their higher economic condition.

As far as nature of illness is concerned we could not provide specific training in assessing morbidity because it was not easy and as such the investigators recorded whatever the respondents

had reported. The assessed nature of illness varied widely and reporting not specific and hence the reported nature of illness may not be reliable. Further as many as one-third of the reported illnesses could not be classified by our investigators (table not shown). As such we have not analyzed the nature of illness.



9.2.2: Duration of Illness and Hospitalization

It is seen from table 9.8 that among those who were reportedly ill, about 27 percent of males and 33 percent of females were ill during the whole year and only about 30 percent were ill for less than one month during the past one year. The duration of illness was the whole year in case of 36 percent of males and 40 percent of females in the age group 40+ and compared to the younger age groups.

Table 9.8 gives percent distribution of persons with illness during the past one year by duration of illness classified by age and sex and table 9.9 gives duration of illness, duration of hospitalization, work/study interruption and expenditure on cure of illness by background characteristics. It is seen from tables that among those who were reportedly ill, about 27 percent of males and 33 percent of females were ill during the whole year and only about 30 percent were ill for less than one month during the past one year. The mean duration of Illness worked out to 147 days in a year. The proportion of persons ill during the whole year was as high as 36 percent among males and 40 percent among females in the age group 40+ and compared to 26 percent in the age group 15-39 and just 8 percent in the younger age group.

The average duration of illness was less than 120 days in one year for those ill among high drip density area, the duration of hospitalization was less than 10 days for those ill among drip/sprinkler farmers, and the median expenditure was more than Rs. 12,000 for those ill among drip/sprinkler farmers and medium/large farmers. It appears that drip/sprinkler farmers could spend more on medical care as compared to others and not that morbidity was higher in

them. Regarding hospitalization, except for 17 percent of the cases, all were reportedly hospitalized for an average duration of 14 days.

The amount the households had spent for the treatment of the illness during the last one year was very high at Rs. 21,613 per person in one year and the median amount was Rs. 9,937. At the same time only 35 percent of the persons had spent up to Rs. 5,000 towards treatment of the illness. With respect to differentials in duration of illness, hospitalization and expenditure on treatment, there were only a few exceptions but otherwise the pattern was similar for all groups.

The analysis shows that a significant proportion of persons in the study area had serious illness for longer durations and the households had to spend a large amount on treatment. That is, many households often loose not only human resource due to illness of members but also face heavy economic burden in terms of cost of treatment. However drip/sprinkler farmers could spend more on medical care as compared to others.

9.3. Nutritional status of Children, Adolescents and Women

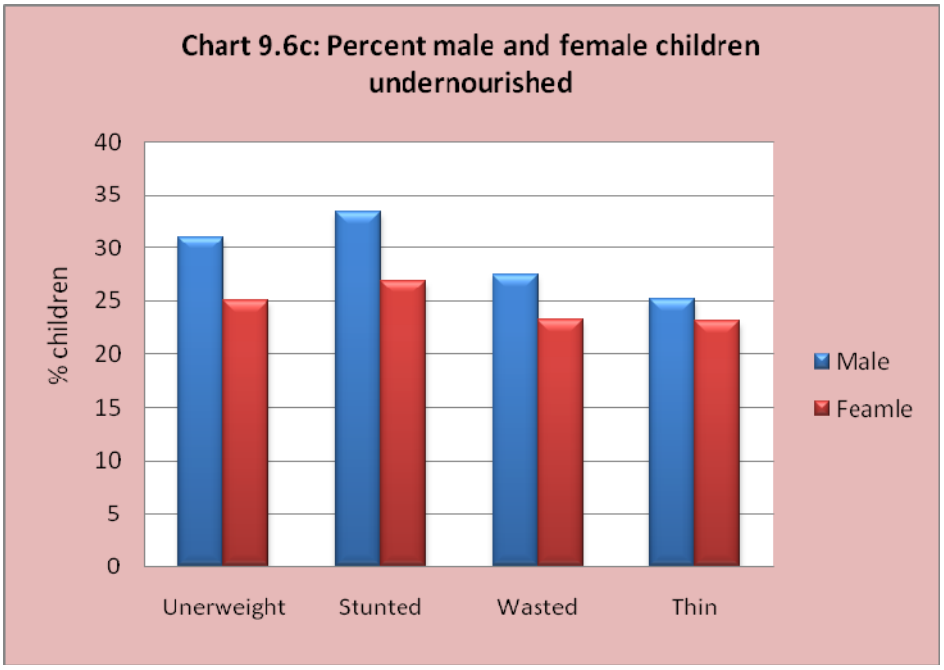
In this survey all surviving children born since January 2006 (age below 60 months) were targeted for measurement of weight, height and mid-upper-arm circumference. However children below age 12 months and those could not stand properly in the 12-23 months age group were not measured height/length as length measuring equipments could not be procured and used. Further all adolescents in the age group 13-19 and all ever married women (EMW) in the age group 20-44 were targeted for the measurement of height and weight only. It is to be noted that females in the age group 15-19, irrespective of their marital status, were included in the adolescents group and excluded from the EMW group for the nutritional status assessment.

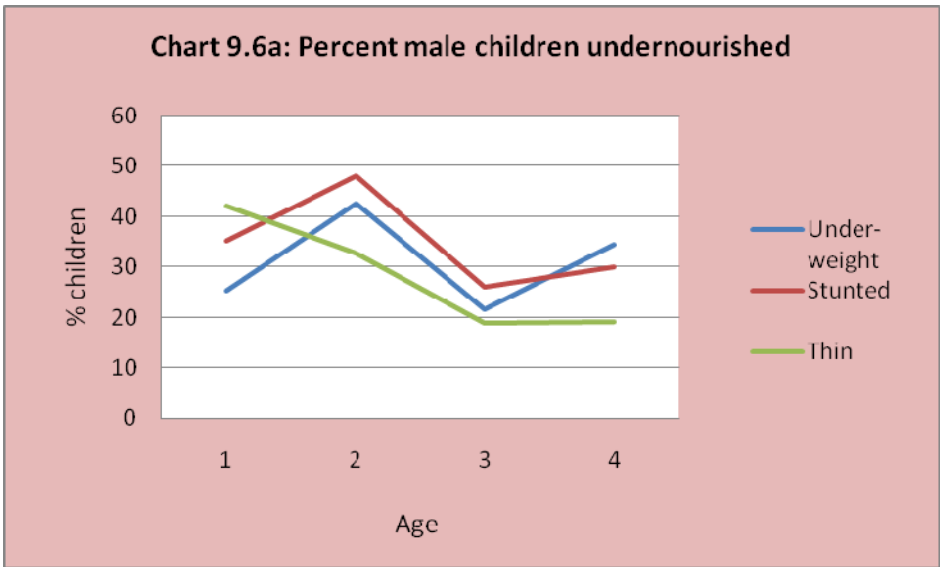
9.3.1: Nutritional Status of Children

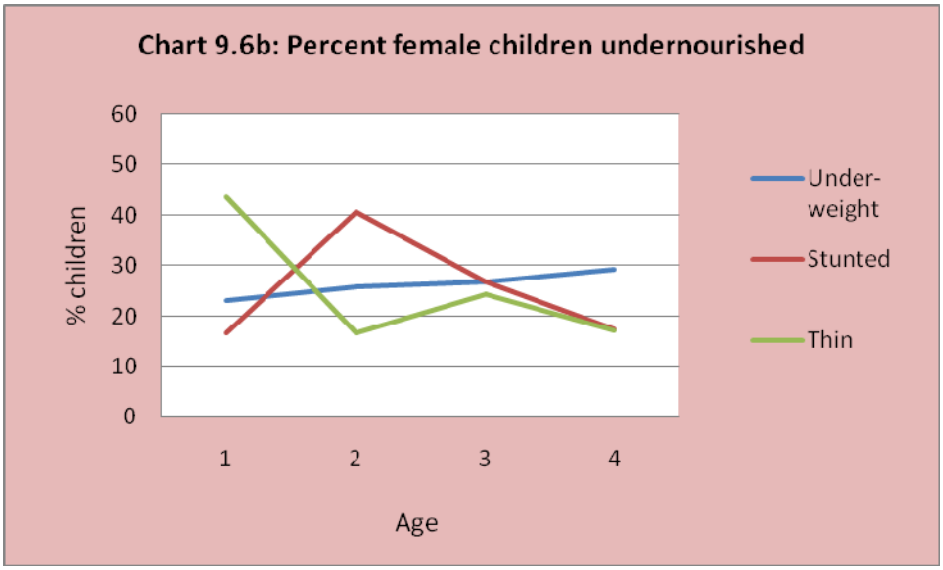
Using the information on sex and age in months, weight in kgs (with one decimal place), height and mid-upper-arm circumference (MUAC) in cms (with one decimal place) were measured and Z-scores were derived using the 'WHO Anthro' software with WHO standard. Table 9.10 gives percent of children below -3SD and percent of children below -2SD for weight-for-height, height-for-age and weight-for-age, BMI-for-age and MUAC-for-age by sex and age of children.

Overall, among children of age 2-4 (24-59 months), about 32 percent of male children and 27 percent of female children were *underweight* (weight-for-age Z score below -2SD), 33 percent of males and 29 percent of females were *stunted* (height-for-age Z score below -2SD) and 25 percent of males and 19 percent of females were *wasted* (weight-for-height Z score below -

2SD) and almost a equal proportion *thin* (BMI-for-age Z score below -2SD). Further 16 percent of males and 8 percent of females were mid upper arm circumference MUAC-for-age Z score below -2SD. It is seen from charts 9.6a and 9.6b that underweight, stunting and thinness has not shown any systematic pattern of increase or decrease by age and also the pattern is different for male and female children. The data show that undernutrition among children in the study area was substantial and it did not change by age. Further it is seen that the extent of children under-nourished was lesser among females than among.







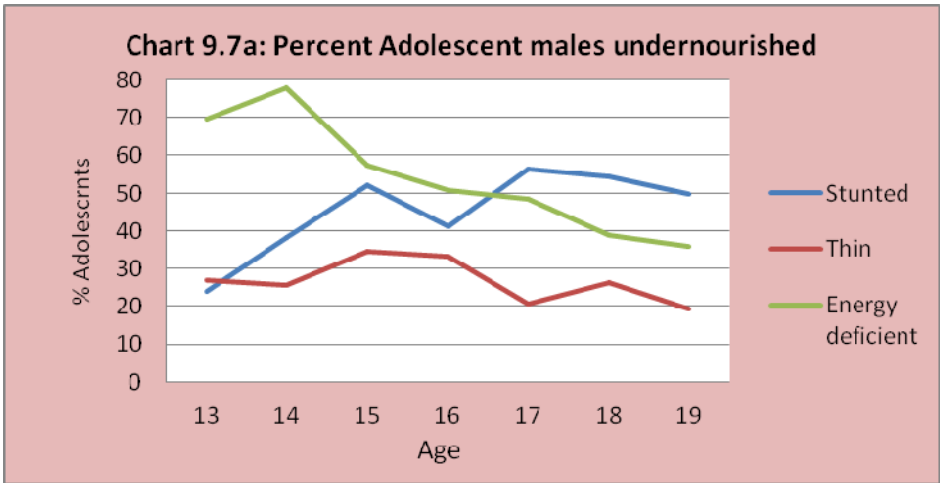
With respect to differentials in undernutrition, table 9.11 gives percent of children age 24-59 months underweight, percent stunted and percent thin by sex and background characteristics. The percent of male children underweight was substantially higher (above 40 percent among male children and above 35 percent among female children) in high drip/sprinkler density area, rain-fed cultivated farmers and household with annual income less than Rs. 50,000. A similar pattern was observed in respect of other indicators as well. However, under nutrition was significantly lower among children of general caste class, drip/sprinkler irrigated and flood irrigated households, and households with annual income more than rupees one lakh.

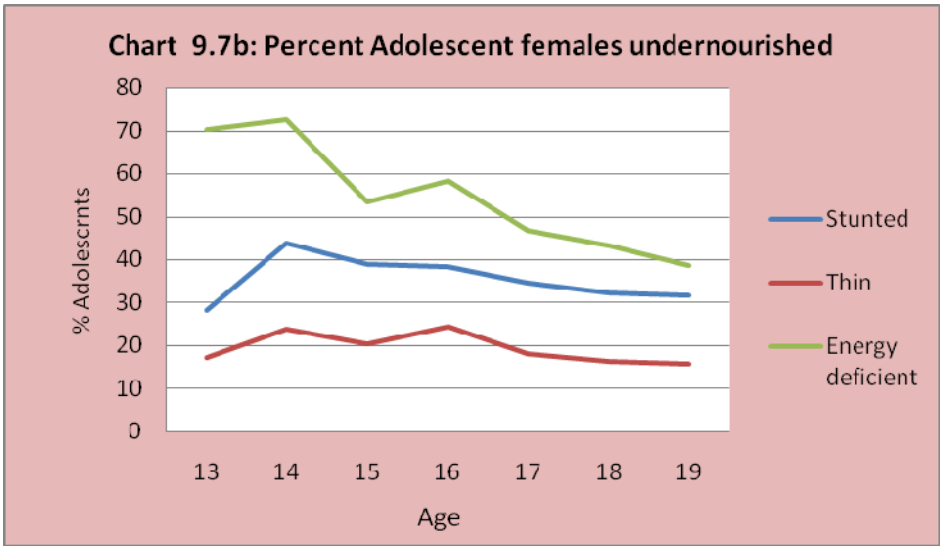
9.3.2: Nutritional Status of Adolescents

Table 9.11 gives percent of adolescents stunted, percent severely stunted (height-for-age Z score below -2SD and below -3SD respectively) and percent thin and percent severely thin (BMI-for-age below -2SD and below -3SD respectively), and percent energy deficient and percent severely energy deficient (weight by height squared, BMI index, below 18.5 and below 16.0 respectively) by age and sex. Charts 9.7a and 7b depict the pattern by age.

With respect to BMI (body-mass-index) measured in terms of weight/Height^2, a BMI value of 18.5 to 25.0 is said to be normal and a higher value is an indication of *overweight/obesity*. On the other side a value of the index less than 18.5 is considered *energy deficient* while a value less than 16 is considered *severe energy deficient*. It is seen from the table and charts that both stunting and thinness were higher among male adolescents than among female adolescents and they slowly decreased as age increased from 13 to 19. With respect to stunting 45 percent of adolescent boys and 35 percent of adolescent girls were stunted and 17 percent of boys and 9 percent of girls are severely stunted. Estimate of thinness based on BMI-for-age Z score indicates that 27 percent of adolescent boys and 19 percent of adolescent girls were thin. However,

among both males and females as many as 55 percent adolescents were energy deficient. In general a large proportion of adolescent boys and girls were undernourished in the study population.





With respect to differentials in stunting and thinness among adolescents, table 9.13 gives percent of adolescents age 13-19 stunted and percent thin by sex and by background characteristics. The data indicate that there is no clear pattern of differences in the indicators of undernutrition among adolescents belonging to different caste classes, categories of farmers and of different income groups.

9.3.3: Nutritional Status of Ever married women

Table 9.12 also gives percent distribution of ever married women (EMWs) of reproductive age (20-44 age group) by body mass index (grade) classified by age of woman. Further table 9.13 gives the index by background characteristics. It is seen from the table that about 24 percent of the women were classified as energy deficient and 3 percent were considered as severe energy deficient. Further the proportion of EMWs with overweight was estimated at 10 percent, which is higher for rural areas. It is clear from the data that EMWs in the study population were somewhat energy deficient but overweight/obesity was significant. There appears to be a tendency of marginal decline in the proportion of women with energy deficiency as they become older but at the same time there is also a tendency of a marginal increase in the proportion of women with overweight/obesity with the increase in age (see chart). There appears to no large differences in the pattern by background characteristics of the women.

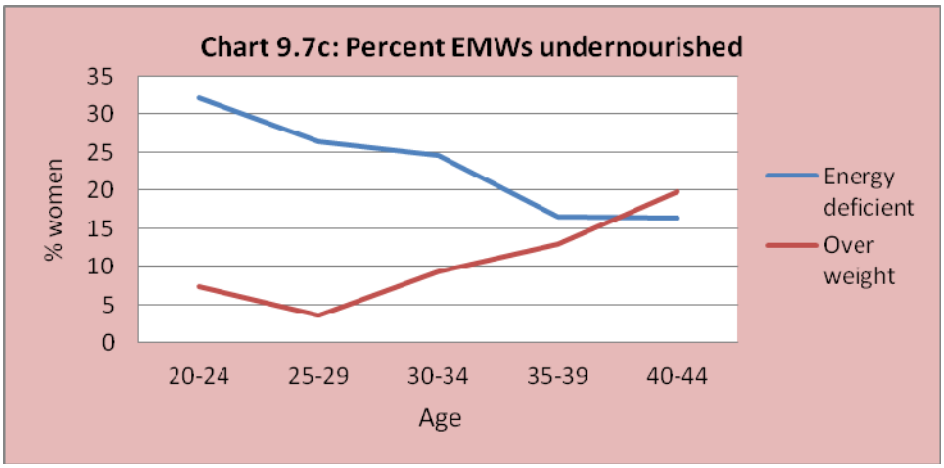


Table 9.1: Crude Birth Rate (CBR) per year based on births occurred during 2006-10, by selected characteristics

Groups and categories	Unweighted		Weighted (not adjusted for unweighted total)			
	Population 2011	$ Births 2006-10	Population 2011	* Population 1Jul 2008	Births 2006-10	CBR per Year
Total	21230	1738	20858	20343	1829	17.98
Caste Class						
SC/STs	6288	569	6993	6820	700	20.53
OBC/SBC	7610	602	6407	6249	552	17.67
General	7332	567	7460	7276	577	15.86
Stratum (Drip density) #						
Stratum1&2: High density	7680	637	7044	6870	628	18.27
Stratum3: Medium density	6680	548	5853	5708	525	18.39
Stratum 4: Low density	6868	553	7964	7767	677	17.43
Study Group						
Drip/ sprinkler	5524	460	2546	2483	219	17.66
Flood irrigation	5770	447	5017	4894	404	16.50
Rain-fed cultivation	4825	382	4697	4581	392	17.10
Landless	5111	449	8599	8387	814	19.42
Cultivated holding (acres)						
All farmers	16119	1289	12260	11958	1015	16.97
Marginal (<=2.5)	5257	395	4605	4492	363	16.15
Small (2.6-5.0)	5559	448	4290	4184	365	17.47
Semi-Medium (5.1-10.0)	3239	247	2142	2089	170	16.27
Medium/Large (10.1+)	2152	199	1237	1206	117	19.35
Annual HH income (Rs)						
<50000	4840	385	5666	5526	449	16.26
50000-99999	6286	507	6602	6439	617	19.16
100000-5000000	10102	846	8591	8379	763	18.21

$ The CBR for category can be considered a reliable estimate if it is based on at least 200 unweighted births.
* The decadal population growth for rural Maharashtra as obtained from the 2011 census is 10.24%. As such a reasonable exponential rate of 1% per year is assumed here.
# Stratum1&2: Jalgaon, Buldana, Nasik; Stratum3: Akola, Solapur, Wardha; Stratum 4: O.bad, A.nagar, Satara

Table 9.2: General Fertility Rate (GFR), Age Specific Fertility Rates (ASFRs) and Total Fertility rate (TFR) based on births occurred during 2006-10, by selected characteristics

Groups and categories	GFR	Age-Specific Birth Rates (ASFRs)						TFR
		15-19	20-24	25-29	30-34	35-39	40-44	
Total	76.2	54.3	211.0	104.9	25.8	3.7	0.9	2.00
Caste Class								
SC/ST/NT/DT	87.2	78.0	207.5	117.5	34.4	4.2	2.9	2.22
OBC/SBC	75.4	45.9	228.9	108.5	21.0	2.1	0.0	2.03
General	66.6	38.0	199.4	91.0	21.0	4.7	0.0	1.77
Stratum (Drip density)								
Stratum1&2: High density	76.5	42.9	216.5	102.0	28.1	2.6	0.0	1.96
Stratum3: Medium density	78.5	62.0	224.6	110.4	33.3	2.3	0.4	2.17
Stratum 4: Low density	74.1	58.3	196.9	103.6	17.2	5.7	2.2	1.92
Study Group								
Drip/ sprinkler	73.5	38.0	204.4	123.2	22.3	6.6	0.0	1.97
Flood irrigation	69.8	45.2	202.9	97.5	20.8	0.0	0.0	1.83
Rain-fed cultivation	75.8	27.0	251.6	96.4	29.5	9.8	0.6	2.07
Landless	80.8	76.8	199.0	108.4	27.4	1.5	1.9	2.08
Cultivated holding (acres)								
All farmers	72.8	37.1	220.9	102.7	24.6	5.1	0.2	1.95
Marginal (<=2.5)	67.5	32.7	223.4	86.3	20.0	8.0	0.0	1.85
Small (2.6-5.0)	77.3	50.9	211.8	127.6	25.8	2.5	0.6	2.10
Semi-Medium (5.1-10.0)	70.9	30.0	212.0	79.4	40.5	6.6	0.0	1.84
Medium/Large (10.1+)	81.3	28.5	258.3	112.7	17.1	0.7	0.0	2.09
Annual household income (Rs)								
<5000	71.4	31.7	264.7	105.4	27.1	1.5	1.3	2.16
5000-99999	81.0	47.2	250.8	114.1	22.5	2.7	2.0	2.20
100000-5000000	75.5	73.6	165.8	97.7	27.7	6.6	0.0	1.86

Table 9.3: Percent distribution of recent births by place of birth and birth attendant, classified by order of birth, and Percent of births registered

Place of birth/attendant	Order of births (2006-2011 births)						% births
	Total	1	2	3	4+	1-2	registered
Government Hospital	31.1	32.3	31.5	30.6	21.9	31.1	96.9
Govt PHC/CHC rural	10.7	10.1	10.9	13.0	8.0	32.0	96.3
Health Subcentre	2.2	1.6	1.7	3.4	7.1	40.3	100.0
Private Hospital	37.1	44.5	36.7	21.8	20.4	28.2	98.8
Home by Nurse/Doctor	3.9	2.4	4.4	5.4	9.2	40.0	94.3
Home by birth attendant	10.2	6.0	9.6	17.6	28.2	41.6	84.1
Home by relatives/other	4.6	3.1	5.1	8.2	5.2	59.8	85.3
Summary							
Government Institutions	44.0	44.0	44.1	47.0	37.1	31.8	97.0
Private Institutions	37.1	44.5	36.7	21.8	20.4	28.2	98.8
Home	18.8	11.4	19.2	31.2	42.5	40.0	86.3
All	100.0	100.0	100.0	100.0	100.0	100.0	95.6

Table 9.4: Percent distribution of births of 2006-2011 by place of birth, classified by selected characteristics

Groups and categories	Place of birth (2006-2011 births)			
	Total	Government Institutions	Private Institutions	Home
Total	100.0	44.0	37.1	18.8
Caste Class				
SC/ST/NT/DT	100.0	39.8	28.5	31.7
OBC/SBC	100.0	45.3	41.7	13.1
General	100.0	47.9	43.0	9.2
Stratum (drip density)				
Stratum1&2: High density	100.0	39.4	32.7	28.0
Stratum3: Medium density	100.0	47.9	35.4	16.7
Stratum 4: Low density	100.0	45.5	42.8	11.7
Study Groups				
Drip/sprinkler	100.0	24.1	59.0	16.8
Flood irrigation	100.0	38.6	48.3	13.1
Rain-fed cultivation	100.0	52.8	31.7	15.6
Landless	100.0	47.9	28.2	23.8
Farmer Category				
All farmers	100.0	41.0	44.2	14.9
Marginal (<=2.5)	100.0	43.5	39.9	16.6
Small (2.6-5.0)	100.0	47.4	41.1	11.5
Semi-Medium (5.1-10.0)	100.0	25.8	54.4	19.9
Medium/Large (10.1+)	100.0	34.7	52.4	12.8
Annual HH income (Rs)				
<50000	100.0	51.5	24.0	24.5
50000-999999	100.0	44.5	35.6	19.9
100000+	100.0	39.1	46.3	14.6

Table 9.5: Percent distribution of births by order of birth, classified by place of birth/birth attendant

Groups and categories	Order of births (2006-2011 births)					
	Total	1	2	3	4+	1-2
Total	100.0	44.1	36.4	13.3	6.3	80.5
Place of birth/attendant						
Government Hospital	100.0	45.7	36.8	13.0	4.4	82.6
Govt PHC/CHC rural	100.0	41.9	37.3	16.1	4.7	79.2
Health Subcentre	100.0	32.3	27.5	20.2	20.0	59.8
Private Hospital	100.0	52.9	35.9	7.8	3.4	88.8
Home by Nurse/ Doctor	100.0	26.4	41.0	18.1	14.5	67.3
Home by birth attendant	100.0	25.8	34.2	22.7	17.2	60.1
Home by relatives/other	100.0	29.1	40.3	23.6	7.0	69.5
Government Institutions	100.0	44.1	36.5	14.2	5.3	80.6
Private Institutions	100.0	52.9	35.9	7.8	3.4	88.8
Home	100.0	26.8	37.1	22.0	14.1	63.9

Table 9.6: Percent of persons reported ill* any time during the last one year by age and sex

All	Persons	Male	Female
Total	5.0	5.5	4.6
00-04	3.3	5.5	0.8
05-14	2.5	3.3	1.7
15-19	1.8	1.8	1.9
20-29	3.1	3.5	2.6
30-39	4.5	4.2	4.8
40-49	6.1	5.8	6.3
50-59	9.2	8.8	9.7
60-69	9.9	9.3	10.4
70+	15.8	20.4	10.5
00-14	2.8	4.0	1.4
15-39	3.3	3.4	3.2
40-59	7.4	7.1	7.8
60+	12.0	13.6	10.5

* Seriously ill, chronically ill, under prolonged or lifelong medication, bed ridden, hospitalized, and the like.

Table 9.8: Percent distribution of persons with illness during the past one year by duration of illness classified by age and sex.

Duration (days)	Age group				
	Total	00-14	15-39	40-59	60+
All					
1-30 days	42.3	63.7	46.9	39.9	30.0
31-359 days	28.3	28.0	27.5	24.2	32.9
Whole year	29.4	8.3	25.6	35.9	37.1
Total	100.0	100.0	100.0	100.0	100.0
Male					
1-30 days	43.2	58.0	45.4	44.6	30.6
31-359 days	29.9	32.5	27.4	24.4	34.7
Whole year	26.9	9.5	27.2	31.0	34.7
Total	100.0	100.0	100.0	100.0	100.0
Female					
1-30 days	41.1	81.7	48.5	35.6	29.2
31-359 days	26.2	13.7	27.7	24.1	30.7
Whole year	32.6	4.6	23.8	40.3	40.1
Total	100.0	100.0	100.0	100.0	100.0

Table 9.7: Percent of persons reported ill any time during the last one year by age and background characteristics

Characteristics	Age group				
	Total	00-14	15-39	40-59	60+
Total	5.0	2.8	3.3	7.4	12.0
Caste Class					
SC/ST/NT/DT	4.3	2.7	2.8	5.9	12.1
OBC/SBC	6.3	3.6	4.3	9.8	12.5
General	4.6	2.1	2.9	6.8	11.6
Stratum (drip density)					
Stratum1&2: High density	5.2	3.5	3.3	7.5	13.4
Stratum3: Medium density	5.1	3.1	3.6	6.5	11.5
Stratum 4: Low density	4.8	1.8	3.1	8.0	11.6
Study Group					
Drip/ sprinkler	5.8	2.7	2.7	10.7	15.6
Flood irrigation	4.8	2.6	2.5	6.5	14.0
Rain-fed cultivation	4.8	2.7	3.4	7.2	9.9
Landless	5.1	2.9	3.9	7.2	11.2
Cultivated holding (acres)					
All Farmers	5.0	2.7	2.9	7.6	12.6
Marginal (<=2.5)	4.9	2.8	3.1	7.7	11.1
Small (2.6-5.0)	5.1	3.2	2.8	7.8	12.3
Semi-Medium (5.1-10.0)	5.0	2.1	3.2	8.3	11.0
Medium/Large (10.1+)	5.0	1.4	1.5	5.7	21.4
Annual household income (Rs)					
<50000	5.6	2.5	4.5	8.1	11.5
50000-999999	4.7	3.5	3.5	6.9	9.0
100000+	4.8	2.3	2.5	7.5	14.4

Table 9.9: duration of illness, duration of hospitalization, work/study interruption and expenditure on cure of illness by background characteristics

Characteristics	Duration of illness (days)			Duration of hospitalization (days)			Expenditure towards cure of illness in one year (Rs)			
	% <30 days	% whole year	Mean duration	Not hospitalized	* % >10 days	*Mean duration	% up to 5000	% above 20,000	Mean expenditure	Median expenditure
Total	41.7	30.1	147	17.2	30.8	14.3	35.4	23.5	21,613	9,937
Caste Class										
SC/ST/NT/DT	40.7	27.9	142	18.1	26.9	16.5	44.7	18.1	18,402	5,987
OBC/SBC	43.2	27.2	139	13.6	25.9	14.9	33.6	23.1	20,662	9,943
General	40.8	35.4	162	20.5	23.7	11.6	29.2	28.8	25,529	11,927
Drip density										
High	51.3	18.7	109	14.2	21.1	12.8	39.5	21.9	16,671	7,987
Medium	33.2	35.4	171	17.0	30.6	20.7	40.6	24.4	22,198	7,996
Low	39.2	36.7	165	20.1	25.7	10.8	27.5	24.4	25,781	9,991
Study Groups										
Drip/ sprinkler	43.1	28.9	140	17.6	21.9	9.1	19.3	33.6	30,397	14,938
Flood irrigation	47.7	28.7	142	15.7	27.0	13.1	26.5	31.0	27,164	11,983
Rain-fed cultivation	43.9	26.6	134	14.3	27.1	16.1	43.1	23.2	20,564	7,929
Landless	36.8	33.1	159	19.4	24.9	15.7	41.5	16.3	16,188	6,972
Cultivated holding										
All farmers	45.2	28.0	139	15.6	25.8	13.3	31.0	28.7	25,470	11,922
Marginal (<=2.5)	43.6	24.1	129	12.4	27.8	17.1	33.0	28.9	23,872	11,901
Small (2.6-5.0)	43.5	32.5	151	22.6	23.8	11.6	37.9	24.4	21,766	9,940
Semi-Medium (5.1-10.0)	47.6	26.4	135	8.4	24.5	9.4	19.6	32.4	28,951	14,923
Medium/Large (10.1+)	53.1	29.1	136	15.2	28.1	11.5	17.7	37.6	38,955	14,992
Annual HH income (Rs)										
<50000	41.3	26.6	139	16.9	26.6	13.6	42.1	21.8	20,098	6,977
50000-999999	42.2	30.7	148	14.3	23.6	17.5	40.2	18.0	15,825	8,965
100000+	41.8	32.1	153	19.2	26.1	12.4	26.3	29.1	27,239	11,955

* Among those experienced (hospitalized, lost work/study, met expenditure, as the case may be.

Table 9.10: Percent of children undernourished and percent severely undernourished by sex and age.

Sex and Age (in years)	Measured		Weight-for-Age		Height-for-Age		Weight-for-Height		BMI-for-Age		MUAC-for-Age	
	Weight*	Height	Under-weight	Severe under-weight	Stunted	Severe stunted	Wasted	Severe wasted	Thin	severely thin	Below -2SD	Below -3SD
All												
0	290	NA	27.7	11.2	NA	NA	NA	NA	NA	NA	13.9	4.6
1	313	135	24.2	8.5	25.8	16.8	44.4	34.2	42.8	36.8	14.8	1.0
2	319	245	33.9	14.9	44.0	23.1	24.7	10.9	24.2	14.1	14.7	5.7
3	336	285	23.8	7.9	26.3	12.6	21.2	8.8	21.2	12.3	15.2	2.2
4	311	272	32.4	9.9	25.0	12.3	21.8	8.0	18.3	8.3	8.9	0.8
Total	1569	936	28.4	10.4	30.5	15.9	25.6	12.7	24.3	15.2	11.4	2.3
2-4	966	802	29.9	10.9	31.3	15.7	22.5	9.2	21.1	11.5	12.9	2.8
Male												
0	184	NA	32.2	13.5	NA	NA	NA	NA	NA	NA	14.7	5.3
1	154	67	25.5	9.1	35.2	28.2	43.8	37.1	42.1	39.0	21.4	1.4
2	155	115	42.7	17.0	48.1	25.1	34.7	13.2	32.8	18.3	22.3	8.3
3	189	163	21.6	6.3	25.9	12.2	20.2	8.0	18.9	11.8	19.1	2.8
4	188	165	34.4	12.3	30.0	16.3	23.3	9.2	19.2	9.7	9.8	0.6
Total	871	509	31.0	11.5	33.4	18.5	27.5	13.3	25.2	16.1	8.0	1.7
2-4	532	442	32.3	11.5	33.2	17.1	25.1	9.8	22.6	12.7	16.5	3.4
Female												
0	106	NA	20.0	7.2	NA	NA	NA	NA	NA	NA	12.3	3.2
1	158	68	23.0	7.9	16.5	5.5	45.1	31.4	43.5	34.6	8.9	0.7
2	164	130	25.7	12.9	40.5	21.4	16.0	8.9	16.5	10.5	7.7	3.3
3	146	122	26.7	10.0	26.7	13.2	22.5	9.8	24.2	13.1	10.0	1.3
4	124	107	29.3	6.3	17.4	6.1	19.5	6.2	17.1	6.2	7.4	1.1
Total	698	427	25.1	9.1	27.0	12.7	23.3	12.0	23.2	14.0	3.4	0.7
2-4	434	359	27.0	10.1	28.9	14.1	19.2	8.4	19.3	10.1	8.4	1.9

* Number measured MUAC is almost the same as the number measured weight

Table 9.11: Percent of children of age 24-59 months underweight, percent stunted and percent thin by sex and background characteristics.

Characteristics	Male			Female		
	Under-weight	Stunted	Thin	Under-weight	Stunted	Thin
Total	32.3	33.2	22.6	27.0	28.9	19.3
Caste Class						
SC/STs	33.6	38.9	26.8	30.3	32.7	18.1
OBC/SBC	36.1	34.7	25.6	31.0	22.6	22.0
General	27.9	26.5	16.1	18.8	28.7	18.7
Stratum						
Stratum1&2	47.1	39.5	28.5	34.0	29.9	24.2
Stratum-3	21.1	38.0	20.1	27.9	30.2	19.2
Stratum-4	27.7	22.6	17.9	20.9	27.2	14.4
Study Group						
Drip/ sprinkler	23.5	33.5	13.5	16.3	22.1	13.9
Flood irrigation	25.5	23.7	20.8	15.2	17.1	20.8
Rain-fed cultivation	42.0	50.1	25.9	35.9	30.1	19.8
Not cultivating/landless	33.0	28.2	24.6	31.0	36.7	19.8
Farmer category						
All farmers	31.7	36.8	21.1	23.8	23.4	19.0
Marginal (<=2.5)	34.3	36.0	25.2	37.5	30.6	26.7
Small (2.6-5.0)	32.2	40.8	20.1	14.8	15.3	11.7
Semi-Medium (5.1-10.0)	26.9	33.9	19.0	11.5	24.3	25.1
Medium/Large (10.1+)	30.5	31.5	15.8	21.6	21.5	4.0
Annual HH income						
<50000	41.5	45.8	25.8	39.8	38.8	21.8
50000-999999	35.6	32.1	23.2	30.5	35.5	16.7
100000-199999	26.5	30.7	19.5	19.9	24.7	19.8
200000+	19.5	21.5	20.6	14.9	13.3	19.5

Table 9.12: Percent of adolescents stunted and percent thin by sex and age, and percent of ever married women energy deficient by age.

Age in years	Persons	Height-for-Age		BMI-for-Age		BMI (Wt/Ht2)		
		Stunted	Severe stunted	Thin	severely thin	Energy deficient	Severe energy deficient	Over weight
Male								
13	140	23.9	7.9	27.1	12.5	69.7	38.8	1.8
14	153	38.2	14.8	25.7	6.6	78.0	31.0	1.3
15	141	52.3	14.1	34.8	10.6	57.6	31.9	0.1
16	149	41.3	15.4	33.4	8.7	50.8	19.0	1.6
17	145	56.6	31.3	20.7	6.3	48.6	14.6	1.2
18	151	54.4	20.1	26.3	9.7	39.0	11.9	0.8
19	104	49.8	12.0	19.4	8.1	36.0	8.1	1.3
Total	982	45.1	16.8	27.1	8.9	55.0	22.7	1.1
Female								
13	138	28.2	9.8	17.1	10.2	70.3	27.1	0.3
14	118	43.8	12.8	23.8	10.6	72.6	31.6	0.2
15	156	39.0	9.9	20.4	6.3	53.6	19.8	4.5
16	138	38.2	6.7	24.4	9.2	58.4	19.6	0.6
17	154	34.5	9.5	18.2	2.2	46.8	11.7	3.4
18	174	32.2	6.8	16.5	3.1	43.2	12.2	1.2
19	97	31.6	3.9	15.8	0.0	38.6	11.8	6.4
Total	974	35.3	8.6	19.4	6.0	54.6	18.8	2.3
Women								
20-24	574	NA	NA	NA	NA	32.2	4.0	7.4
25-29	719	NA	NA	NA	NA	26.5	4.4	3.6
30-34	624	NA	NA	NA	NA	24.7	2.3	9.3
35-39	629	NA	NA	NA	NA	16.6	2.4	13.0
40-44	467	NA	NA	NA	NA	16.5	1.5	19.8
Total	3013	NA	NA	NA	NA	23.6	3.0	10.0

Table 9.13: Percent of adolescents age 13-19 stunted and thin by sex and percent of ever married women age 20-44 energy deficient by background characteristics.

Characteristics	Age 13-19 years (Adolescents)				Age 20-44
	Male		Females		Energy
	Stunted	Thin	Stunted	Thin	deficient
Total	45.1	27.1	35.3	19.4	23.6
Caste Class					
SC/STs	48.4	26.0	37.3	18.3	25.8
OBC/SBC	39.2	27.6	39.6	20.1	22.8
General	47.2	27.7	29.5	19.9	22.2
Stratum					
Stratum1&2	53.6	28.3	42.9	15.4	23.0
Stratum-3	45.9	30.1	38.1	21.6	26.1
Stratum-4	36.5	24.1	25.6	22.1	22.4
Study Group					
Drip/ sprinkler	51.0	27.0	32.1	15.2	18.9
Flood irrigation	40.0	32.5	25.9	23.5	26.2
Rain-fed cultivation	53.1	25.5	40.7	14.0	25.5
Not cultivating/landless	42.2	24.7	38.7	20.7	22.6
Farmer category					
All farmers	47.1	28.8	32.6	18.4	24.3
Marginal (<=2.5)	53.1	28.0	35.5	16.2	27.6
Small (2.6-5.0)	44.2	29.2	33.0	17.8	22.5
Semi-Medium (5.1-10.0)	45.8	29.5	30.9	20.0	24.8
Medium/Large (10.1+)	35.1	28.7	19.9	27.9	17.3
Annual HH income					
<50000	45.7	28.3	42.5	18.3	28.8
50000-999999	51.1	27.9	36.0	20.4	21.1
100000-199999	44.2	27.7	27.5	23.2	26.9
200000+	31.2	21.6	33.4	13.8	16.5

CHAPTER 10

People's Perceptions through FGDs

Another component of the study was qualitative investigations in terms of focus group discussions (FGDs) and case studies. The qualitative research was conducted in order to find the motivation for and experiences of farmers with drip irrigation, perceived changes in their economic and social status due to increased yield by adopting drip irrigation, village rejuvenation, attitude of farmers and youngsters about the viability of agriculture and younger generation taking up farming as their profession/occupation in the light of modern methods of agriculture and higher yield from crops. The focus group discussions and case studies were conducted in villages where something peculiar was observed by the survey team such as progressive trend in farming, cropping pattern, penetration of micro irrigation system and farmers reporting higher yield. This qualitative research is meant to explain, substantiate and exemplify the findings of the quantitative survey.

For focus group discussions mainly 3 groups were considered, namely, farmers (males) who adopted drip irrigation, wives of drip irrigating farmers and younger generation (males) of drip irrigating farmers. In-depth interviews were conducted with progressive drip irrigating farmers (early adopters of drip system, farmers who progressively added more and more areas under drip irrigation, farmers who produced high crop yield through drip irrigation, etc). The FGDs and case studies were conducted in selected villages in which the household survey was conducted. The FGDs and case studies were conducted to facilitate an in-depth understanding of micro-irrigation among farmers in villages and its implication in the lives of the farmers in particular and in the community in general and the socio-economic transformation taken place in the society.

Altogether 10 FGDs of drip irrigating farmers, 5 FGDs of wives of drip irrigating farmers and 3 FGDs with young men aged between 19-35 years were conducted and 10 case studies or in-depth interviews were conducted across the nine districts. The number of participants in the

FGDs varied from 7 to 10 and undertaking drip irrigation at least during the past three years. However when it comes to FGDs with wives of drip irrigating farmers only a few were literate and they usually worked in their farms. This report also has generated insights from the various field visits the team had made to a number of villages in different talukas of Jalgaon district.

10.1: Cropping pattern across regions

Cropping pattern depends not only on the agro-climatic conditions like rainfall, temperature, soil quality but also on the availability of seeds and saplings and the market for the crops. Discussions with farmers revealed that of late even small and marginal farmers have started adopting micro-irrigation system (drip and sprinkler) because they have seen that with drip/sprinkler system, farmers have received higher yield and higher income for their produce. The FGDs conducted in Satara district showed that very few farmers adopted drip irrigation mainly because according to them their land area was small and fragmented and they were not much aware of drip irrigation. They practiced rain-fed cultivation as they did not have enough water to undertake irrigation. Thus the penetration of drip irrigation in this area was low and hence the farmers have not learnt from their own fellow farmers about the advantages of drip irrigation. In Solapur region the awareness of drip irrigation was very high and the landholding was also high in comparison to Satara. It was mostly large farmers who adopted drip irrigation because they had their own water sources and they were willing to invest in it, because in this region pomegranate was the main crop and it fetched good income for them. However, of late, pomegranate was affected by a disease and the small farmers could not afford the risk and so now the pomegranate cultivation has dropped substantially.

In Osmanabad and Ahmednagar districts the farmers were aware of micro-irrigation but according our houselisting only a few farmers have adopted it. However an FGD conducted in Wagholi village in Kalamb taluka of Osmanabad revealed that farmers did not have enough water for drip irrigation as the water table in that region was very low and not many farmers could afford to dig a well or have a bore well. The main crop in Ahmednagar was Sugarcane which was mostly flood irrigated and not drip irrigated. When it comes to areas where sugarcane was cultivated, it was their practice for decades as there were many sugar factories in this region, which facilitated the farmers to sell their crop easily for a reasonable price. A case study with a farmer in Shevgaon taluka of Ahmednagar revealed that farmers are offered both monetary support in the form of loans and assured price for their produce by the sugarcane factories. The farmer said that once they have planted the crop, the harvesting is done by the workers from the factories themselves and the loan amount usually is deducted from the price of the produce.

In Nashik district, the farmers had a very high level of awareness of drip irrigation and most of them cultivated grapes on drip irrigation. Sprinklers were mainly used to irrigate vegetable crops like bell peppers, zucchini and lettuce that were grown mainly to cater to the needs of the nearby Mumbai city. A farmer who exports grapes abroad said that Nashik has good soil and climate, however the terrain is uneven. He said that, “Drip irrigation has made farming easier and it ensures a good yield as it makes it possible to irrigate all the land area uniformly in spite of the uneven terrain”.

In Jalgaon district drip penetration was the highest and the main crops were cotton and tissue culture banana. In Jalgaon district and in parts of Nashik district drip irrigation has now become the most preferred way of agriculture. This is mainly because of the deep involvement of JISL in this region. In an FGD conducted in Parola taluka’s Hirapur village the drip irrigated farmers revealed that they had more access to Jain drips than any other company. Another reason why they adopted drip irrigation was because it was of good quality and the cost also was affordable.

In Buldana, Akola and Wardha districts the main crops grown on drip irrigation was cotton. When it comes to the trend of farming it is difficult to explain the cropping pattern existed earlier and that is followed now but when it comes to cotton it can be said that since the last four years farmers have resorted to Bt cotton as its more disease resistant and it gives a higher yield. In this region sprinkler was also used, but not on regular basis. It was usually during the initial stages of the crops especially when the monsoon is delayed and for the germination and/or growth of cotton, soya bean and wheat plants. Across Akola and Wardha districts micro irrigation has also brought about inter cropping where we can see farmers growing tur dal, channa dal etc. between cotton ensuring an additional income for them.

10.2: Experiences with Drip and Sprinkler Irrigation

Across all the nine districts it was found that drip sets supplied by JAINS were the predominant micro irrigation system adopted by the farmers, followed by Netafim, EPC, Kothari, Finolex and Tulsi. Others companies mentioned were Kisan, Aqua, Sun drips and Texmo. Sprinklers by JAIN, Aquaguard, Hasti, Premier, were seen across the Vidarbha region. The factors guiding the choice of drip/sprinkler brand were availability, quality, affordability, popularity, and pre and post installation services. However, the farmers often complained that after-sale services by most drip suppliers were inadequate or even absent.

A common benefit of drip irrigation expressed by the farmers across all the districts was that despite load shedding they could irrigate their crops uniformly and almost daily. Drip irrigation also made it possible for the farmers to grow certain cash crops like strawberries in Satara, pomegranates in Solapur and grapes in Nashik, which cannot be grown without drip. A case study in Satara with a strawberry farmer revealed that drip irrigation has facilitated the growing of good quality strawberries which is sent to Mumbai and other places that fetched them higher income. Another contribution of micro irrigation in strawberry farming is that, it involves huge labour during the harvesting season and therefore many people get employment during this season and sometimes the wage rates goes up from 100 to 250 rupees a day. In Satara district people go to the nearby Panchgani and Mahabaleshwar for working in strawberry farms, which shows that people in the villages are also ready to move from their hometown in order to get employment and to get higher wages.

It can also be seen that drip irrigation has also substantially increased and sometimes even multiplied the yield of crops, especially banana and cotton in Jalgaon and grapes in Nashik. In an FGD with drip irrigated farmers in Hirapur village of Parola taluka in Jalgaon district most of the farmers said that drip irrigation contributed to the uniform growth of banana and there has been very fewer diseases seen among the banana crops after using tissue culture plantlets of banana. Some of the tissue culture banana farmers also said that they go for Jain tissue culture plantlets because the company itself was monitoring the growth of the crops and again their drips sets are also available and accessible within the village.

In Vidarbha region which faces delayed rainfalls, wheat, cotton and soya bean are often sown in advance and sprinklers are used in the germination of the seeds during which period the requirement of water is less. And, by the time when the monsoon starts the seeds germinate into plantlets and are ready to grow with the monsoon rain. The case studies conducted in this area revealed that the farmers felt that drip irrigation had solved, at least partly their problems of labour availability, especially for large farmers, because of the fact that drip irrigation minimizes weeding, and fertigation makes it possible to apply fertilizers to the entire area of crops evenly through drip irrigation. This, together with water and electricity savings, makes drip irrigation the most effective and efficient irrigation method for many farmers.

To talk particularly of JAIN drip, it was observed that since JAIN drip sets come in a wide range of products and prices, it becomes affordable for many farmers. Hence marginal, small and large farmers adopting JAIN drip irrigation have mushroomed across rural areas. It was seen in most cases that both small and large farmers were aware of subsidies for drip and sprinkler set. Where the dealer himself subtracted the subsidy amount from the total cost of the drip set the farmers were able to get subsidy. Otherwise, it would have been a nightmare for them if they had to claim it from the government department directly. According to a few farmers the gov-

ernment takes longer duration to sanction it to individual farmers and they prefer it going through the dealers as they have their links within the government and so they can get it done faster.

Across the nine districts, the FGDs with drip irrigated farmers revealed that some farmers were unaware of the exact amount of subsidy as the dealers themselves reduced the amount and then the farmers made payment for the drip set to them, but they said that they have received it nonetheless. The farmers said that they only had to give two forms from the village panchayat to the dealers, one about their area of land they are going to cultivate under drip and another certifying the crops to be grown in that area and then the dealers themselves makes the lateral design etc for installing drips.

Despite a majority of the farmers buying their drip sets from dealers, be it JAIN or any other company, most of the farmers reported that they did not receive any formal training for installation, operation and maintenance of the drip system. It was also observed across the nine districts that small farmers preferred to install the drip sets by themselves in order to save the Rs. 500/- installation charges usually the dealers charged. The FGDs also showed that the majority of the farmers did not need any training as they were mostly well aware of the installation techniques as they have observed it in neighboring farms or they have attended some farmers meeting in their neighborhood where they were already introduced to drip installation and its maintenance techniques. Most of farmers also were technically more sound especially in Jalgaon and Nashik were drip penetration was very high and when it comes to Vidarbha region farmers were very comfortable using sprinkler method of irrigation and they installed it whenever they wanted and sometimes they even give it for other farmers on rent and help them install it in their farms especially during a delayed monsoon etc.

JAIN has a wide network of service outlets (dealers) and extension service personnel provided information, education and services for drip irrigation through campaigns, short duration orientation trainings, individual contacts, and the like. But even among JAIN customers, there were instances of farmers complaining of inadequate services may be due to the sheer volume of drip sets supplied by them.

10.3: Socioeconomic indicators of prosperity

It can be said that for an average farmer an increase in income means a better standard of living in terms of fulfilling his family's basic needs, and for some farmers it is an opportunity to invest in various kinds of movable and immovable properties, and still for some to spend on personal consumable goods, on education of children and in side-business. However, most

farmers tend to invest the extra income back to agriculture either by extending more and more land under micro irrigation system or installing drips and pipes in their flood irrigated or rain-fed cultivated land.

In Nashik and Solapur districts, the FGDs with drip irrigating farmers reported that they increasingly brought more and more land under drip irrigation and also invested in livestock mainly in cows for milk as the latter again is a source of income to the family. On the other hand, an opinion that came from a drip irrigating farmer in Gondhanapur village of Buldana district was that agriculture, even with micro irrigation, was manageable only if it was supplemented with a fixed income from another source. Such subsidiary income sources help the farmers face the intermittent risks which are inevitable in agriculture. In Ahmednagar district, the FGDs revealed that the farmers mainly invested renovating their houses or extending their land under drip irrigation. Very few farmers reportedly bought tractors but many bought two wheelers. A handful of farmers reported to have bought harvester after getting a good yield and they also said that they will give the harvester on rent as it is in huge demand. One such farmer was seen in an FGD conducted in Akola's Dhanapur village in Telhara taluka. Another farmer in the same village who is a doctor by profession said that he has a good income from his farming and that he usually invests the returns in farming itself mostly by extending the land under drip irrigation and also now he is going to change his existing drip company that of EPC to Jain drips because he has seen that the latter is of better quality.

In Satara and Vidarbha regions, farmers mostly invested their profits back in agriculture. Although not everybody could afford drip, farmers in Vidarbha region invested in at least one sprinkler set. The FGDs conducted with wives of drip irrigating farmers across the nine districts were however unable to generate much opinion about the higher income obtained due to drip irrigation and with regard to investing them as most of them were shy and were not aware of the contributions of drip irrigation. Most of the women said that they prefer to cook for their family and go to the field only during the sowing period. Very few of the participants were able to share openly how they invested the additional income got after using drip system. And some women belonging to the Marwadi community in Akola's Vidarbha region never ventured into the fields and they mostly remained in the household.

The emphasis on education was clear in most villages, where priority was given to education of children. Most farmers revealed that they would be happy if their children could do farming, but preferred them getting gainful employment because according to them farming was uncertain, insecure and required painstaking efforts. The FGDs conducted with the wives of drip farmers also revealed similar opinions as they felt that their children should get a regular employment where they get assured income and they will not have to slog themselves across the year.

The FGDs among both the drip irrigated farmers and their wives across nine districts revealed that most of the children nowadays are not interested in pursuing agriculture and it is not seen as an assured source of employment. Some of the drip irrigating farmers who had more than one child said that they preferred only one child who is poor in studies to remain in agriculture while others should pursue a government job. Although we found many farmers with graduate degrees in the villages, an FGD with a group of young men in Jalgaon's Hirapur village admitted that it was due the lack of gainful employment or due to their failed efforts to get a job in the city that made them to remain with agriculture. A case study of a young progressive farmer in Akola's Dhanapur village also said that despite completing his graduation successfully, he was unable to find a decent job and therefore he remained with agriculture. He said that he does not have an occupation as he did not considered his involvement in agriculture as an occupation even though it gives him an annual income.

Food habits have definitely underwent a change across Maharashtra even in many rural areas where outside food items like *namkins* and cold drinks were bought more often. The FGDS with wives of drip irrigating farmers revealed that there has definitely been a difference in the food habit in their households. Nowadays children go to schools or colleges and so they have their own preferences of eating and they are more attracted to potato wafers and other picketed items rather than eating home grown sprouts or lentils. When they were asked about venturing out as a family for having food etc, they said that practice is almost absent and mostly their husbands buy vegetables and meat from the market and they prepare it at home and eat it. An FGD with a group of young men in Osmanabad's Wagholi village revealed that gambling, drinking and other addictions like chewing tobacco and gutkha are definitely on the rise in rural Maharashtra, irrespective of prosperity. They said that it is part of certain culture and habits and therefore an increase in income has not necessarily bought a definite change in these practices but otherwise it has happened. Women's participation in agriculture activities in most villages is at par with men mainly in sowing, weeding and harvesting. FGDs revealed that in Vidarbha region women worked in the fields more often than men did, and the reasons for the same are not clear, though it appears that women are paid very less as compared to men.

10.4: Insights from Field Visits around Jalgaon

During the course of the study, the study team visited JAIN Company (Jain Agro-park and Jain plastic-park) a number of times and in each time they were taken to a few villages in Jalgaon district. The team had visited villages in Erandol, Parola, Raver and Bhusaval talukas and had on the spot dialogue with farmers who adopted drip irrigation, contract farming, tissue culture and the like. They also visited fields to see for themselves the growth of and yield from plants like

cotton, banana and onion, especially of tissue culture plants such as banana and onion. The farmers with whom the team had interaction included not only large farmers but also small and marginal farmers who also cultivated other crops like jowar, soya bean, tur dal, gram, and the like as main crops and/or as rotation crops. Many large farmers admitted that they not only possessed large land but also irrigated them with drips. Some farmers have also leased-in a large area of land, because in some families the persons were employed elsewhere and their land was available for cultivation by others.

The farmers generally felt that they could get more yield due to drip irrigation, and much more with tissue culture plants and contract farming. In a village Jarandi in Jalgaon, it was seen that farmers with even one acre of land has adopted drip irrigation for cotton crop and practiced all modern techniques like fertigation and he got an average of 22-25 quintals per acre. Due to the adoption of a combination of these methods their income has multiplied and they could construct better houses, have modern goods in their homes, could possess two-wheelers and four-wheelers, increase out-door activities and entertainments, better educate their children, and also buy more and more land for increasing their profitability. However some farmers also revealed that despite better yield due to adoption of drip irrigation, their agriculture is not fully secured due to various factors like draught and insufficient ground water, unseasonal and heavy rains, load shedding, unusual pest attacks, non-availability or high labour cost, and above all fluctuations in and sometime very low price for their produce. So, invariably many farmers, especially medium and large farmers, tend to have some other income generating activities as well for their income security like having dealership for fertilizers and other equipments needed for farming. As such for many farmers it is not only the farming specifically drip farming that has made them prosper but also the side-business (or additional activities) that have contributed substantially to their prosperity. Some farmers in village Jarandi said that, it was their side-business that sometimes fetched more income for them than their own farming activities.

The farmers also revealed that they provided higher education to their children whoever had shown more interest in it. Among the farmers contacted, all invariably revealed that one of their sons often whoever was weak in studies looked after agriculture and others became engineers, doctors and the like and employed or practicing elsewhere. Nonetheless, drip irrigation has made a revolution in many villages towards increasing agricultural productivity, giving more income, adapting modern agricultural techniques and contributed to social changes for the individual families. Many villages have village cooperatives that give loan to farmers at nil or low interest rates that have motivated them to install drips, cultivate commercial crops and earn more income like the ones the team witnessed in Jarandi and Girodha villages. These village cooperatives also ensured that the farmer is not taxed with the burden of selling his produce in distressed and some cooperatives pool the yields, locate a buyer and then sell the produce for good price. For example, in some villages, the cooperative executives said that most of the ba-

nanas are sold to buyers from Delhi who come here with trucks and loads huge quantities of banana and sell it at the sabji mandar there. In general the village cooperatives encouraged farmers to take up agriculture as a profession and ensured maximum income for them.

10.5: Social Equity and Justice

It is felt that marginal and small farmers around Jalgaon could have probably never experienced such prosperity but for the intervention of drip, tissue culture and contract farming of the JAIN model. Since these farmers have taken to multiple crops, they have also provided gainful employment to many hands in addition to their own. This employment generation is yet another social benefit from the introduction of the modern agriculture technologies such as drip, tissue culture and contract farming. Drip irrigation ensures more work for laborers at high wage rates throughout the year. The multi cropping pattern also mitigates the adverse effect of climate change and vagaries of nature. The Drip irrigated crop can sustain even during draught like situation. This ensures income security even for marginal and small farmers. In effect drip irrigation does help reduce the inequalities, and bridges the wide disparity gap of income between the large and small farmers.

10.6: Government Apathy

TISS team observed that rural areas are neglected by the government. The populace also has not much say in deciding government policy. Hence there is individual progress but public utilities are in bad condition. In most of the villages the team had visited, the condition of the villages in terms of better road connectivity, public transport facilities, sanitation, toilet facilities and the like are very poor and they looked like the old traditional Indian villages in spite of rich individual family incomes. A few villages even looked like town-like appearance with big houses and building but again basic infrastructure facilities were found very poor. When asked why the residents especially the large farmers did not do something for the betterment of the village, they replied that they approached the government functionaries many times but still the agencies were not doing anything. Thus, on one hand we could see a rejuvenation of individual families partly due to drip irrigation but on the other hand there was a near absence of an overall village development and so we need to go a long way in achieving a holistic rural development.